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Harbours review

cyber

technology

sustainability

The Port of Opportunities

The Port of HaminaKotka is a versatile Finnish seaport serving trade and industry. The location of HaminaKotka at the logistics hub makes the port truly unique – it opens up connections to all parts of the world.

Welcome to the port of HaminaKotka!

haminakotka.com

PORT OF HAMINAKOTKA

editorial

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dear readers,

Welcome to the newest instalment of the printed version of our journal, your humble bundle of the finest transport & logistics pieces we gathered during the past couple of months!

This issue is all about the light and dark sides of technology. On the one hand, there's the cyber threat, which, as the title of the opening article reads, is today *The norm, not the exception*. As such, one needs to set up a *Digital defence, Making the hackers' job hard*, including *The enemy within*. That said, there's *A long way to go* before one obtains *The cyber security seal*.

On the other hand, the industry is *Set for lift off*, because incredible things can happen *When human meet algorithms*, such as *Reshaping logistics*. But how to achieve that? Well, *Communication is everything* and *Well-informed shipping* can get a tech-savvy company – one that's asking questions like *IT and containers: a fitting or pinching match – Off the blocks* towards becoming *Green and smart*.

Investing in technology is like *The rub of the green*, it can make a difference, and some are already *Leading by example.* After all, we've got only *One atmosphere* and we should do our best so that each and every earthling could breathe freely. Is technology, therefore, a *Guarantee against inefficiency* and that *Innovation distinguishes between a leader and a follower*? We'll see. For now, let us start a new chapter of what otherwise seems to be *A never-ending story*.

Have a great, cyber-technology-sustainability read!

PS. Don't forget to visit www.harboursreview.com for more free of charge insights, news, and statistics; smash the e-newsletter subscribe button; and last but not least partner with us to help surface and spread all 'round the world what the transport & logistics domain has best in its store!

przemysław myszka

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Photo: All free download

Piraeus-NASPA New Maritime Silk Road MoU

The **Piraeus Port Authority** (PPA), controlled by the Chinese **COSCO**, has signed an agreement with the **North Adriatic Sea Port Authority** (NASPA). The deal is aimed at strengthening cargo flows between Piraeus and NASPA's **Venice** and **Chioggia**. As such, the parties will jointly work on coordinating the development of their ports, incl. infrastructure and services, in order to facilitate freight flows between Europe, the Mediterranean, and the Far East. Also, they'll exchange best practices and know-how in port management, particularly in the fields of IT, communications, and attracting investments. **Pino Musolino**, President, NASPA, commented, "In an upcoming scenario which foresees a powerful increase of trades between Asia and Europe along the new maritime Silk Road, it is necessary to put all our efforts on the rationalization of the logistics chains, starting from the ports and from the road connections with the inner markets, in order to shorten distances, to lower transports costs, to remove trucks from roads and improve the environmental sustainability of trades." He furthered, "Through this agreement, which is coupled with the other recently signed with COSCO Shipping for a weekly connection Piraeus-Venice, we want to clearly show that the development of trades primarily requires commercial agreements, optimization of services and targeted infrastructure interventions. This is the right path to create value for our economy and for our territory." **Capt. Fu Chengqiu**, CEO, PPA, added to this, "The Port of Piraeus, the largest port of Greece and the Eastern Mediterranean, is an ideal hub between Asia and Central & Eastern Europe. It is the first deep-sea EU port after crossing Suez Canal and offers combined transport solutions with efficient value-added services for cargoes, which can be re-distributed by road, rail, and sea. The establishment of our cooperation with the North Adriatic Sea Port Authority is targeting to strengthen the trade links between Asia and Mediterranean and to enhance the role of ports as engines for the European economy."

Navis and COSCO create a joint Center of Excellence

The Center (CoE) will deliver dedicated resources from both parties for the implementation of **Navis**' N4 terminal operating system (TOS) across **COSCO Shipping Ports**' (CSP) facilities as well as support on-going optimisation initiatives of the Chinese company. The CoE model is a long-term engagement between Navis and CSP aimed at enabling the latter to implement the projects themselves, shortening the timeline to deliver services through dedicated, on-site, and remote resources. Over time, the CoE will transfer tasks currently executed on-site in projects to be performed remotely, including base configuration, test support, automated testing, code extensions, etc. Key areas supported by the CoE include Content Governance (define and use of a CSP standard delivery methodology and tools; this area will be based on Navis' methodology and adapted to support CSP strategy); Platform Management (deploy N4 as the sole standard TOS across the CSP portfolio and fully automate business process testing of software releases against CSP requirements); IT Landscape (define the CSP IT landscape and explore the use of multi-facility setup for small terminals without on-premise hardware); Knowledge and Skills Management (training based on Navis STACK Academy with CSP curriculum and certification to build up a team of N4 experts within CSP); and Change Management (support CSP in the change to Navis as the singular TOS solution; support will also oversee organizational and operational change management). The new partnership builds on a previous deal, as earlier in 2018 CSP entered into a subscription agreement with Navis to implement the N4 TOS across its network (269 berths in 38 ports worldwide, of which 179 are for handling containers). The CoE is organized to deliver several projects, regardless of terminal type (greenfield, semi-automated, automated), in parallel as CSP facilities migrate to N4. "Joining forces with COSCO Shipping Ports is the latest in a string of strategic partnerships for Navis with innovative terminals committed to cutting-edge technology and is a logical next step stemming from our subscription agreement earlier this year. As CSP works to bring its full network of terminals onboard N4, our dedicated teams, both at the CoE and regional level, will be there every step of the way to ensure smooth transitions and substantially improve implementation timelines. CSPs customers will now have access to a global team of Navis experts, dedicated to helping them get the most out of our software to achieve operational excellence," **Bruce Jacquemard**, Chief Customer Officer, Navis, commented. **Zhang Wei**, Vice Chairman and Managing Director, COSCO Shipping Ports, added, "Our partnership with Navis and the CoE is critical for the multi-facility setup of N4 that is already underway – providing one central solution for all terminals within our corporate infrastructure. With Navis' help, we'll create a standardized delivery method, based on their years of experience as the leading TOS in the market and key takeaways from the hundreds of N4 implementations that they have successfully executed. With a scalable and repeatable approach, global experience backing the CoE and supplemental regional teams, CSP is well positioned to bring N4 live across our network and improve overall operational efficiency."

Rotterdam gears up for Brexit

Photo: Port of Rotterdam

The **Port of Rotterdam**, the **Rotterdam** and **Vlaardingen municipalities**, and the Dutch **Directorate-General for Public Works and Water Management (Rijkswaterstaat)** are creating five new buffer parking sites for the trucks that may run into customs clearance problems if the UK decides to leave the EU without a trade deal. Up to 700 lorries will be able to wait there temporarily if their customs documents have not been properly prepared for maritime crossings to the UK post-Brexit. The aim of the coordinated action is to minimise any extra delays resulting from additional customs formalities at the ferry and short sea terminals – as required in trade with third countries – so as to ensure freight traffic to the UK runs as smoothly as possible. Additionally, more intensive passport checks and inspections made by the **Netherlands Food and Consumer Product Safety Authority** could mean longer processing times at terminals. On the northern bank in **Hoek van Holland**, the Municipality of Rotterdam has allocated the 200 trucks-big **Oranjeheuvel** site, close to the ferry terminal. In **Maasdijk**, in the **Municipality of Westland**, Rijkswaterstaat has created a buffer site for around 50 trucks. In the Municipality of Vlaardingen, a site is being created on **Waterleidingstraat** for around 80 trucks. On the southern bank, in turn, buffer parking sites are being created on **Moezelweg** and **Seattleweg** by the Port of Rotterdam Authority. The former site, located in the vicinity of the ferry and short sea terminals that operate out of the **Europoort** area, will provide space for approximately 290 trucks. The Seattleweg site will provide space for approximately 80 trucks. The buffer parking sites will be only accessible to trucks that have not been given access to the ferry terminals in the Port of Rotterdam because the Portbase system has not received prior notification of their cargo. Truck drivers can use these locations to liaise with their client or transport planner and make sure the necessary formalities can yet be completed. Exporters, hauliers, and shippers are advised to use Portbase to provide digital notification of their cargo that is destined for the UK. "Using this Dutch supply chain solution for Brexit, cargo can pass quickly and without unnecessary delay through customs to and from the UK, even after Brexit," a press release from the Port of Rotterdam read. In preparation for Brexit, the Port of Rotterdam Authority and the port's ferry terminals have jointly carried out a simulation on the possible impact Brexit might have on Rotterdam's UK-bound wheeled freight traffic. Based on historical data, it has been assumed that approximately 400 trucks will not have their formalities in order. This, in result, allowed estimating the required number of temporary buffer parking places for heavy goods vehicles to be prepared in advance. Of the roughly 54mt traded annually between the UK and Netherlands, around 40mt passes through the Port of Rotterdam. The bulk of the volume uses ferry and short sea crossings.

Hapag-Lloyd to gas-retrofit one of its 15k TEU-big ships

Photo: Wikimedia Commons

The carrier has contracted the Shanghai-based **Huarun Dadong Dockyard** to convert *Sajir*, one of the company's 17 vessels that were originally designed to be LNG-ready. The ship's fuel system and its existing heavy fuel oil-burning engine will be converted into a dual-fuel one. The plan will be to operate the vessel using liquefied natural gas and also to use low-sulphur fuel oil if needed. According to **Hapag-Lloyd**, the conversion will make it possible for *Sajir* to emit 15%-30% less CO_2. "By converting the *Sajir*, we will be the first shipping company in the world to retrofit a container ship of this size to LNG propulsion. By carrying out this unprecedented pilot, we hope to learn for the future and to pave the way for large ships to be retrofitted to use this alternative fuel," **Richard von Berlepsch**, Managing Director Fleet Management, Hapag-Lloyd, commented.

Sustainable marine biofuel oil put to the test

On 19 March, a **CMA CGM** container carrier was bunkered in the **Port of Rotterdam** with second generation biofuel derived from forest residues and waste cooking oil. The bunkering was a result of a co-op struck between **IKEA Transport & Logistics Services**, CMA CGM, the **GoodShipping Program**, and the Rotterdam port – the aim of which is to demonstrate the scalability, sustainability, and technical compliance of sustainable marine biofuel oil, and thereby spur the wider continued development of realistic options to curb greenhouse gas and sulphur oxide emissions from shipping. "This announcement comes at a time when the shipping sector is at a crossroads, with owners and operators required to switch to low sulphur fuels by 2020. The industry also faces impending International Maritime Organization (IMO) Greenhouse Gas (GHG) reduction requirements, including an objective to reduce average carbon intensity from shipping – the amount of carbon emitted for each unit of transport – by at least 40% by 2030, and 70% by 2050," a joint press release stated. The testing is being facilitated by the GoodShipping Program, a sustainable initiative dedicated to decarbonising ocean freight and is the latest step in the scaling of low carbon marine biofuel oils for wider commercial use within the maritime industry. The sustainable marine biofuel oil has been developed by **GoodFuels** following three years of intensive testing with marine engine manufacturers. According to the company, the second generation biofuel oil is expected to deliver 80-90% well-to-propeller CO_2 reduction vs. fossil equivalents. In addition, GoodFuels says, its product virtually eliminates sulphur oxide (SO_x) emissions – and does it without any requirement for engine modifications. "Through our pilot, we want to show that the means for decarbonisation in terms of alternative fuels are available. We have a responsibility to do our part to reduce the impact of our ocean freight. Through our participation, we send a signal to our customers and the ocean industry on our commitment to decarbonise. Only through collaboration can we achieve rapid, necessary change. With a successful pilot completed, our intention is to put the equivalent of at least all our containers out of Rotterdam on biofuel," **Elisabeth Munck af Rosenschöld**, Head of Sustainability, IKEA Global Transport & Logistics Services, said. **Dirk Kronemeijer**, CEO, The GoodShipping Program, added, "The aim of our program has always been not only to reduce carbon emissions from shipping but to show that the means to accelerate the energy transition are already available for the sector to grasp. Together we send a very clear message: sustainable biofuels are ready today, and we can meet the pathways laid out by the IMO in a manner that is attractive to major cargo owners such as IKEA." **Xavier Leclercq**, Vice President, CMA CGM, also commented, "Having an HFO-equivalent solution in bio-fuel oil available with no engineering or operational changes required to our vessel offers a safe, manageable and innovative opportunity to facilitate shipping's wider transition to new fuel solutions." **Allard Castelein**, CEO, the Port of Rotterdam, summed up by saying, "The Port of Rotterdam considers this initiative by IKEA, CMA CGM and GoodShipping to be a strong rallying cry to the shipping industry. This bunkering shows that decarbonisation of sea trade is well achievable. It's clear that shippers play an important role in decarbonising the industry. In Rotterdam the necessary infrastructure is available. Besides that, to support these kind of initiatives, we have just started a four year period during which we have €5 million to spend on stimulating specific projects to reduce carbon dioxide emissions from the global shipping industry."

ABB to furnish Iceland's new e-ferry

The Swedish-Swiss company will supply integrated power and electric storage solutions to the **Icelandic Road and Coastal Administration**'s new vessel. The 70 m-long ferry, designed by Polarkonsult and due for delivery later this year from the **CRIST** shipyard in Poland, will feature a 3,000 kWh-strong battery pack as well as a diesel-electric generator set. Though the ship is designed to operate in the fully-electric mode for most of the time, the latter will be used to add power during particularly challenging weather conditions while covering the 13 km- and 45 min-long route between **Landeyjahöfn** on the mainland and the **Westman Islands**. The scope of the supply deal also includes generators, transformers, switchboards, the Power and Energy Management System, and the Energy Storage Control System. The ferry will be connected to **ABB** Ability™ Collaborative Centers Infrastructure, a network that uses remote equipment monitoring and data analytics to enable remote technical support as well as predictive maintenance and planned interventions. The ferry will also have the ABB's power distribution system Onboard DC Grid™, which will allow the batteries to connect directly to the DC link and by doing so avoid losses of power during charging and discharging. The Swedish-Swiss company will deliver the onshore power supply system, too, in order to recharge the battery with a power of 2,500 kW. According to ABB, it will, on average, take about 30 minutes to recharge. The newbuild, offering space for up to 550 passengers and 75 cars, will replace the 1992-built *Herjólfur*, which during rough weather had to travel to an alternative harbour to berth safely, extending the sailing time from 45 minutes to close to 3 hours (the new ferry will be able to enter the destination harbour in challenging weather conditions most of the time, with the rare exception of particularly rough seas). "Opting for ABB's electric solutions allows the vessel to meet design constraints that initially seem in conflict: it is optimized for cleaner operation and reduced greenhouse gas emissions, whilst power is sufficient to navigate some very hazardous waters safely," **Sigurdur Gretarsson**, Director, Maritime Division, Icelandic Road and Coastal Administration, said. **Juha Koskela**, Managing Director, ABB Marine & Ports, added, "Selection of ABB's technologies for a vessel operating on such a tough route, where the water depth is sometimes limited to 4.5 meters, but wave heights can reach 3.5 meters, sets a new benchmark for battery power on board a ship. In line with our vision for electric, digital and connected shipping, this project demonstrates how system integration – whether on board the ship or between the ship's crew and shoreside expertise – is a key success factor for vessel management."

Russia's to have a new seaport in the Baltic

The 70mt of annual handling capacity **Primorsk Multipurpose Transshipment Complex** (PMTC), an investment valued at RUB90.6b (€1.21b), is planned to be up and running by 2022. The new port, spanning over 780 ha, is to handle coal, mineral fertilisers, containers, other general cargo, and grains. The PMTC will function as a special economic zone. The agreement on the construction of the new port complex was signed by **Alexander Drozdenko**, Governor of the **Leningrad Region**, and **Ramis Deberdeev**, Chairman of the PMTC's Board of Directors at the **Russian Investment Forum**. "The project approved by the Federal Marine and River Transport Agency is included into the Strategy for Social and economic development of the Leningrad Region through 2030 and long-term development programme of FSUE Rosmorport till 2020," **PortNews**, a Russian information agency, reported. PortNews also informed, "The project on construction of a multipurpose deep sea port is to be implemented in the Vyborg District of the Leningrad Region in compliance with the strategy on taking over Russia's foreign trade cargo from the ports of the Baltic states."

Grimaldi to upgrade its fleet's communication capacities

The Neapolitan shipping company spent €5m on a contract with the Rome-headquartered **Telespazio**, a JV between **Leonardo** and **Thales** (67/33), to provide satellite communication services. The first agreement provides for managing on-board communications for ro-ro, multi-purpose, and pure car & truck carrier vessels in the **Grimaldi** fleet that operate between Northern Europe, the Americas, West Africa, and the Mediterranean. Specifically, Telespazio will take care of the design and supply of on-board systems for satellite communications and related broadband services, including backup, on a multi-regional scale. These services will be provided via Telespazio's global coverage platform operated by the **Fucino Space Centre** located in L'Aquila, Southern Italy. The second agreement covers renovating basic (voice and data) satellite telecommunication services for crew and passengers on mixed cargo-passenger ships that the Grimaldi Group operates in the Med., between Italy (incl. Sardinia and Sicily), Greece, Spain, Tunisia, Morocco, and Malta.

Photo: Telespazio

VELA-Wilson Sons Group cloud co-op in Brazil

The Group's container terminals **Tecon Rio Grande** and **Tecon Salvador** will, as the first in Latin America, work with **XVELA** as early adopters of the company's cloud collaboration platform. According to XVELA, early visibility can help terminal operators identify potential issues in advance and resolve them before they have a negative effect on the vessel operations. This includes real-time notifications of any mismatch between the carrier's stowage plan and actual stowage execution, such as a hazardous box in a non-hazardous slot, so potentially costly mistakes can be corrected before load operations are complete, reducing the risk of ships not sailing on time. The terminals will use the solution to collaborate with **Log-In Logistica**, a provider of cabotage door-to-door intermodal logistic services in Brazil and the greater Mercosur region (apart from Brazil also Argentina, Paraguay, and Uruguay). "As the first terminal operators in Latin America to use XVELA, Tecon Rio Grande and Tecon Salvador demonstrate that they are leading the way toward a more reliable and service-oriented supply chain," **Guy Rey-Herme**, President, XVELA, said. He furthered, "By working directly with their ocean carrier customers through XVELA's business network, Tecon Rio Grande and Tecon Salvador, along with any carriers calling at these terminals, can benefit from a win-win collaboration that drives greater efficiency, higher resource utilization, and better service for all parties."

Container majors target digitalisation through a new association

Maersk, CMA CGM, Hapag-Lloyd, MSC, and **Ocean Network Express** are discussing the setup of a new non-profit body the aim of which will be to pave the way for digitalisation. According to the founding members, this is to be done through creating common information standards that will be openly available and free of charge to all stakeholders involved in the initiative. The association has no intent of developing or operating any digital platform. It will also not discuss any commercial or operational matters. The association will kick off its works in early 2019 (granted it gets the regulatory approvals if any will be needed). "MSC believes that we've reached the point in the carrier world where we need something that is common, open and done in the framework of a neutral and non-profit association. By collaborating on standardized solutions, we think that's the best way to respond to shippers' demands for technology and innovation, thus shaping the future of the shipping industry. […] Together, we gain traction in delivering technological breakthroughs and services to our customers compared to working in our own closed silos," **André Simha**, CIO, MSC, and spokesperson of the group, said. **Adam Banks**, Chief Technology & Information Officer, A.P. Møller-Mærsk, added, "A joint set of technical standards will ensure interoperability and enable all parties to concentrate on value adding differentiation as we move the container shipping industry towards further digitalization. Ultimately this will benefit all parties in our customers' supply chains." **Noriaki Yamaga**, Managing Director, Corporate & Innovation, Ocean Network Express, also said, "Ocean Network Express sees a wave of innovation technology development in shipping and logistics industry over the recent years which can bring good opportunity to the whole industry for digital transformation. But, at the same time, we're a little bit cautious about adopting new technology by individual company since there is no common standard in the market which may be ending up with re-integrating work among all stakeholders in the supply chain. With this mind, we feel it would be necessary to do some discussion and collaboration on the area of new technology and innovation to establish common IT standard and governance for the industry to streamline and digitize shipping process in a modern way."

KMOU and MMU students to train on Kongsberg Digital's simulators




Photo: Kongsberg Digital

The Norwegian provider of next-generation software and digital solutions will furnish the South Korean *Segero* and *Hannara* sister training ships with real-time training simulators. Specifically, K-Sim Navigation, K-Sim Engine, and K-Sim Cargo simulators will be installed on-board the vessels belonging to the **Korea Maritime and Ocean University** (KMOU) and **Mokpo National Maritime University** (MMU). The K-Sim Navigation bridge, for instance, will be set up in a room behind the vessels' real bridges and will be configured to project either simulated sailing areas based on new Korean database models or the real view from the actual bridge, via on-board CCTV cameras, with data from real on-board sensors. By these means, students on the simulator bridge will have access to the exact same view as students on the real bridge, so that real-time situations can be discussed back and forth, and performance indicators can be compared. "The onboard simulators on these vessels introduce a whole new degree of realism. Instructors will be able to make clear, informed assessments and fine-tune simulator exercises as they see fit, while students will be able to access real-time vessel data and apply it to training routines in the virtual realm before moving forward to the main bridge and restaging operations with the actual ship," **Mark Stuart Treen**, Vice President Sales, **Kongsberg Digital**, explained. He also said, "Combining simulator technology with real in-situ assets represents an exciting new venture for Kongsberg, and reflects our purpose as a company in supporting customers in new territories, stimulating economic growth and tirelessly pushing the envelope with innovative applications for our technology leading simulators."


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THE PORT OF ALGECIRAS:
4,773,079 TEUs handled in 2018 (+8.7% yoy)

In terms of tonnage, containerised freight traffic totalled 60.59mt last year, marking an uptick by 5.2% on the 2017 result.

The Port of Algeciras' volumes

	2018	2018/2017
General cargo	69,062.43kt	+5.5%
Liquids	31,763.06kt	+10.4%
Local traffic	2,274.35mt	-4.9%
Supplies (bunker)	2,541.87kt	-10.3%
Dry bulk	1,718.44kt	-18.3%
Fishing	878.0kt	-13.4%
Total	**107,361.03kt**	**+5.7%**
Unitised freight traffic		
TEUs	4,773,079	+8.7%
Ro-ro cargo units	338,587	+5.4%
Passenger traffic		
Ferry	5,952,840	+7.5%
Pax cars	1,213,451	+1.6%

THE PORT OF TRIESTE:
62.68mt handled in 2018 (+1.2% yoy)

With 43.23mt (-1.2% year-on-year), the turnover of liquids accounted for the bulk of the Italian seaport's 2018 cargo traffic.

The Port of Trieste's volumes

	2018	2018/2017
Liquids	43,234.7kt	-1.2%
General cargo	17,776.3kt	+7.4%
Dry bulk	1,665.5kt	+1.6%
Total	**62,676.5kt**	**+1.2%**
Unitised freight traffic		
TEUs	725,426	+17.7%
Ro-ro cargo units	299,343	-1.0%
New vehicles	9,955	-16.8%
Passenger traffic		
Cruise	42,724	+56.3%
Ferry	68,815	-38.7%
Total	**111,539**	**-20.1%**

THE PORT OF DUBLIN:
37.99mt handled in 2018 (+4.3% yoy)

"Every year from 1993 to 2007 was a record year in Dublin Port. In the past four years we have seen this pattern re-emerge, with 2018 the fourth year in a row for record growth," Eamonn O'Reilly, Chief Executive, Dublin Port Company, commented. He continued, "Dublin Port's multi-million euro infrastructure investment programme continued with capital expenditure of 93m during 2018. Our investment in infrastructure is matched by our customers' continuing investments in new ships with huge freight capacity. Even as the €149m 2,800 lane metre W.B. Yeats enters service in Dublin Port, we are preparing for a second new Irish Ferries' ship with 5,610 lane metres and also for Stena Line's 3,100 lane metre E-Flexer, both due to enter service on the Dublin-Holyhead route during 2020. "While BREXIT brings uncertainties and challenges to our business, the combination of investments by our customers and by Dublin Port is underpinned by shared confidence in the future. Whether we are faced with a hard BREXIT or not on 29th March, it will become clearer in the coming days and weeks. If we are, Dublin Port will have significant additional border inspection post capacity available for State agencies in time. Coping with the challenges of a hard BREXIT is a challenge not only for us but also for State agencies and our customers. We will be as prepared as it is possible to be," O'Reilly underlined.

The Port of Dublin's volumes

	2018	2018/2017
Cargo traffic by destination (thousand tonnes)		
Imports	22,741	+5.5%
Exports	15,253	+2.5%
Cargo traffic by freight type (thousand tonnes)		
Wheeled (ro-ro)	24,050	+2.7%
Containerised	6,924	+3.8%
Liquids	4,621	+7.8%
Dry bulk	2,375	+16.8%
Break-bulk	24.0	+7.2%
Total	**37,994**	**+4.3%**
Unitised freight traffic		
Ro-ro cargo units	1,031,897	+4.0%
TEUs	726,212	+4.0%
Vehicles	103,443	+4.1%
Passenger traffic		
Ferry	1,827,674	-1.0%
Cruise	177,641	+23.4%
Total	**2,005,315**	**+0.7%**
Pax cars in ferry traffic	508,960	-1.2%

UTLC – ERA:

62,622 TEUs carried across the New Silk Road in Q1 2019 (+54% yoy)

The traffic from Europe to China totalled 27,086 TEUs (+69% year-on-year) while in the opposite direction 35,536 TEUs (+44% yoy). In Q1 2018, the company – a joint venture between the railways of Belarus, Kazakhstan, and Russia – took care of some 40.7k TEUs, around 33% more than in Q1 2017.

THE PORT OF THESSALONIKI:

12.89mt handled in 2018 (-17.3% yoy)

The overall decrease was mainly driven by the 42.8% year-on-year slump noted in export traffic, which at the end of 2018 totalled 3.38mt. At the same time, imports lost 1.7% yoy and amounted to 9.51mt. Out of the total figure, the turnover of liquids reached the level of 6.63mt (-14% yoy), dry bulk – 3.41mt (+7% yoy), while general cargo – 2.85mt (-39.1% yoy). Thessaloniki's container traffic advanced by 5.6% yoy to a total of 424,500 TEUs. On the other hand, fewer passengers went through the quays of the Greek port – down by 11.7% yoy to 44,474, out of which 1,502 came on-board cruise ships (-38% yoy).

Photo: Port of Trelleborg

THE PORT OF HAMINAKOTKA:

16.17mt handled in international & transit traffic in 2018 (+10.3% yoy)

Exports rose by 3.4% year-on-year to 11.23mt while imports by 30% yoy to a total of 4.94mt. The Finnish ports also took care of 792.3kt in coastal traffic -, down by 21.8% on the result from 2017. With 653,443 TEUs at end-2018, HaminaKotka's container traffic noted a downtick by 5.3% yoy.

THE PORT OF HIRTSHALS:

148k ro-ro cargo units handled in 2018 (+4.2% yoy)

Hirtshals' ro-ro and ferry cargo traffic grew for the 10th consecutive year. Overall, the Danish seaport handled 1.9mt last year, more or less the same volume as in 2017. The handlings of stone and gravel came to a halt in 2018, but the increase noted in ro-ro traffic managed to fill in the missing turnover.

THE PORT OF TRELLEBORG:

1,161,462 ro-ro cargo units handled in 2018 (+3.2% yoy)

The Swedish port also served a record number of passengers last year, up by 4.2% year-on-year to a total of 1,831,290 guests.

PORT OF HAMBURG:

8.7m TEUs handled in 2018 (-1.0% yoy)

Out of the total, railbound container traffic amounted to 2.44m TEUs, up by 4.7% on the result from 2017. Similarly, out of the 135.1mt (-1.0% year-on-year) handled in the Port of Hamburg last year, some 46.8mt came in or went out on rails, an increase by 2.7% yoy and a new all-time high for railborne freight transports.

The Port of Hamburg's volumes

	2018	2018/2017
General cargo, out of which Containerised Break-bulk	90.9mt 89.4mt 1.5mt	-0.9% -1.0% +5.8%
Bulk goods	44.2mt	-1.2%
Total, out of which Imports Exports	**135.1mt 79.7mt 55.4mt**	**-1.0% +1.7% -4.6%**
Container traffic (million TEUs)		
Imports	4.6	-0.6%
Exports	4.2	-1.5%
Total, out of which Laden	**8.7 7.6**	**-1.0% +/-0%**
Pax traffic		
Passengers	900,562	+10.8%

Photo: Port of Hamburg

THE PORT OF ROTTERDAM:

468.98mt handled in 2018 (+0.3% yoy)

The increase was driven by containerised and wheeled (ro-ro) freight, as the handlings of both dry and liquid bulk contracted last year.

The Port of Rotterdam's volumes

	2018	2018/2017
Liquids (thousand tonnes)		
Crude oil	100,294	-3.7%
Oil products	77,673	-1.9%
Other	28,640	-0.9%
LNG	5,234	+164%
Total	**211,840**	**-1.1%**
General cargo (thousand tonnes)		
Containerised	**149,111**	+4.5%
Wheeled (ro-ro)	24,057	+1.1%
Break-bulk	6,361	-1.5%
Total	**179,529**	**+3.8%**
Dry bulk (thousand tonnes)		
Iron ore and scrap	30,059	-3.6%
Coal	26,356	+2.3%
Other	11,348	-6.3%
Agribulk	9,853	-11.6%
Total	**77,615**	**-3.2%**
GRAND TOTAL	**468,984**	**+0.3%**
Containers		
TEUs	14,512,661	+5.7%
No. of boxes	8,635,782	+5.4%

Photo: Port of Rotterdam

HUPAC:

926,414 road consignments by rail in 2018 (+21.4% yoy)

"This strong growth is partly attributable to one-off effects such as the recovery of traffic losses due to the Rhine disruption in 2017 and the acquisition of ERS Railways in June 2018," a press release from HUPAC explained. ERS Railways contributed with some 92k consignments to HUPAC's non-transalpine traffic, which, in total, rose by 98k consignments in 2018. Transalpine traffic via Switzerland increased by 67k consignments, out of which more or less half was due to the recovery of the volumes lost following the seven weeks-long blockade of the Rhine valley route in August-September 2017. In 2019 Hupac expects transport demand to stabilise as a result of the economic downturn. "Now is the time to focus on the quality of the services. We must ensure a stable environment on which new growth can be built," Michail Stahlhut, Director, HUPAC Intermodal, underlined.

HUPAC Intermodal's volumes (road consignments by rail)

	2018	2018/2017
Transalpine via CH	535,777	+14.4%
Non-transalpine	351,870	+37.9%
Transalpine via AT and FR	38,767	-4.4%
Total	**926,414 (equiv. to 1.72m TEUs)**	**+21.4%**

THE PORT OF GDYNIA:
23.49mt handled in 2018 (+10.7% yoy)

The Polish seaport noted its new all-time freight high thanks to double-digit increases in the turnover of general cargo, coal and coke, and other dry bulk goods.

The Port of Gdynia's volumes

	2018	2018/2017
General cargo (excl. timber)	13,817kt	+10.9%
Grains	2,995kt	-14.0%
Coal and coke	2,629kt	+23.2%
Liquids	1,759kt	-3.3%
Other dry bulk	1,311kt	+21.5%
Timber	979kt	+318%
Ores	–	-100%
Total	**23,490kt**	**+10.7%**
Container traffic		
TEUs	803,871	+13.1%


Photo: Port Gdynia/Tadeusz Urbaniak

THE PORT OF ANTWERP:
223.66mt handled in 2018 (+5.2% yoy)

The Belgian port noted its new freight turnover all-time high thanks to all major cargo groups marking an increase.

The Port of Antwerp's volumes

	2018	2018/2017
General cargo, out of which	138,296.4kt	+5.8%
Containerised	122,969.2kt	+6.4%
Break-bulk	10,274.2kt	-1.1%
Wheeled (ro-ro)	5,053.0kt	+5.4%
Bulk, out of which	85,364.8kt	+4.1%
Liquid	73,174.1kt	+3.6%
Dry	12,190.7kt	+7.2%
Total, of which	**223,661.2kt**	**+5.2%**
Imports	**114,256.4kt**	**+6.0%**
Exports	**109,404.8kt**	**+4.3%**
Container traffic (TEUs)		
Exports	5,481,642	+5.9%
Imports	4,969,241	+6.5%
Total	**10,450,882**	**+6.2%**
Finished vehicle logistics (cars)		
Exports	699,224	+4.8%
Imports	538,904	+4.6%
Total	**1,238,128**	**+4.7%**

Photos: Rawpixel

The norm, not the exception

by Mike Yarwood, *Claims Executive, TT Club*

Many in the marine supply chain business have operations characterised by widespread office networks and a reliance on multiple third party suppliers. Often IT systems are of an in-house, legacy nature, which may be poorly protected by security software. Specifically, ports and terminals are exposed to threats as they are at the confluence of physical and communications activity. Unfortunately, according to the data we've gathered, supply chain operators are vulnerable to disruptive cyber activity, from criminals or other perpetrators, impacting operations and putting commercially sensitive or confidential data at risk.

The data interfaces are complex and the drive towards interconnected control systems and efficient processes, exacerbates the opportunities for outside malicious interference. Most of all, at the ship-port interface there's much opportunity to cause loss and damage, far beyond the persistent exposure to criminal activity (Tab. 1).

At the core

The problem is intensifying. At a global level reports by AV-TEST, a German independent research institute for IT security, indicate that on average 4.2 new files of malware code were generated every second in 2017. From a maritime supply chain perspective an example of a serious IT incursion in 2017 was the spoofing attack on over 20 ships in Novorossiysk. Navigation experts claim the spoofing sent false signals and resulted in shipboard equipment providing false information as to the location of the ships. There is speculation that this incident could have been a state-sponsored attack. A second incident, the NotPetya strike, impacted many in the supply chain, including A.P. Møller-Mærsk, resulting in large scale disruption and substantial costs for those immediately impacted and their partners (Tab. 2).

Tab. 1. Perpetrators: motivation and objectives

Group	Motivation	Objective
Activists (incl. disgruntled employees)	Reputational damage	Destruction of data
	Disruption of operations	Publication of sensitive data
		Media attention
		Denial of access to the service of system targeted
Criminals	Financial gain	Selling stolen data
	Commercial espionage	Ransoming stolen data
	Industrial espionage	Ransoming system operability
		Arranging fraudulent transportation of cargo
		Gathering intelligence for more sophisticated crime, exact cargo location, off ship transportation and handling plans, etc.
Opportunists	The challenge	Getting through cyber security defences
		Financial gain
States; state-sponsored organisations; terrorist	Political gain	Gaining knowledge
	Espionage	Disruption to economies and critical national infrastructure

Source: BIMCO Guidelines on Cyber Security Onboard Ships

Tab. 2. Significant maritime cyber attack incidents

Date	Victim	Consequences
11/17	Clarksons	Perpetrators gained unauthorised access to computer systems, accessing confidential information and threatening to release information unless ransom payment is made. Company share prices decreased by 2.71%
06/17	Ships in Novorossiysk	At least 20 ships in the Black Sea were reporting false data was being transmitted, indicating the ships were 32 km inland of their actual position. It is now believed to have been as a result of a Global Navigation Satellite Systems spoofing attack
06/17	A.P. Møller-Mærsk	NotPetya, also known as ExPetr, ransomware led to outages on the company's computer systems, impacting both oil & gas production and port operations. Following the incident, Maersk claimed to have changed its IT systems to prevent similar incidents from occurring in the future. The incident resulted in an estimated $300m of losses
04/16	South Korea	Some 280 ships were forced to return to port due to problems with their navigation systems. The issue was largely blamed on North Korea, however, this remains unconfirmed
2012-14	Danish Maritime Authority	An e-mail virus spread through the port network that was likely initiated through an infected PDF document. The virus spread and successfully reached other Danish government institutions
2012	Australian Customs and Border Protection Service agency	Cargo systems controlled by customs and border protection were hacked in order to determine which shipping containers were suspected by the authorities
2011-13	Port of Antwerp	The port had been a victim of an advanced persistent threat attack since 2011 commissioned by a drug cartel. The attack targeted terminal systems which were subsequently compromised by hackers and used to release containers without port authorities becoming aware. Illicit drugs and contraband worth approx. $365m, firearms and approximately $1.5m were seized when authorities finally became aware
08/11	Iranian Shipping Line (IRISL)	The servers were hacked, resulting in damage to data relating to rates, loading, delivery and location. Consequently, the location of many cargo containers remained unidentified and an undisclosed amount of financial losses were incurred as a result

Source: NYA

As to the extent of attacks, research that is available reveals a worrying situation. A BIMCO survey in 2016 suggested that more than 20% of respondents admitted to cyber attacks and in 2017 a SeaIntel Maritime Analysis report estimated that 44% of the top 50 container carriers had weak or inadequate cyber security policies and processes.

The US Coast Guard issued a draft Navigation and Vessel Inspection Circular (NAVIC) titled *Guidelines for Addressing Cyber Risks at Maritime Transportation Security Act (MTSA) Regulated Facilities*. The circular currently under review requires incorporation of personnel training, drills and exercises to test capabilities, security measures for access control, handling cargo, delivery of stores, procedures for interfacing with ships and security systems and equipment maintenance.

Additional national and regional initiatives, exemplified in the European Union by the Directive on Security of Network and Information Systems (NIS Directive) and General Data Protection Regulation (GDPR), are indicative of the development of regulatory expectations. While the latter does not directly address it, cyber protection is intrinsically at the core of data protection. Such initiatives, together with known vulnerabilities, highlight that cyber security is ever more pertinent for ports and terminals, as well as the broader supply chain community.

Cyber corporate culture

As an insurance mutual, TT Club has always been dedicated to minimising risk through its loss prevention efforts. By publishing *Risk Focus: Cyber – Considering Threats in the Maritime Supply Chain*, jointly with the UK P&I Club and the cyber security consultants NYA, we hope to generate more awareness of the risks to help combat the situation. "As the feasibility of a more damaging attack increases, all stakeholders – in particular ports and terminals, and shipowners and operators alike – must prepare for the inevitable. Appropriate plans and processes need to be established and enforced to mitigate against this growing threat," the authors of *Risk Focus* underlined.

Ultimately, the main threat continues to derive from human error – downloading malicious content, opening an unsecured web browser or falling victim to social engineering attacks and phishing scams. As such, awareness of the nature of potential attacks and the need for protection is clearly a crucial initial step towards a thorough risk assessment and mitigation – and this needs to become part of corporate culture. ■

Photo: Rawpixel

Digital defence

by Nikos Späth, *Head of Media & Public Relations, DNV GL Maritime Communications*

Although the notion of a ship in the middle of the ocean being disabled by a software malfunction or by hackers was initially greeted with considerable scepticism and denial, a spate of incidents, including most notably an attack that disrupted operations at COSCO, has transformed attitudes. Today the maritime industry acknowledges the potential dangers and is taking steps to address the cyber risk at various levels. As owners act to fortify their ships and shore-side operations against cyber risk in the face of evolving threats and imminent regulation, DNV GL has expanded its services to cover control systems, software, procedures and human factors.

Cyber security is a moving target. Threats continue to grow in reach and complexity, with new vulnerabilities discovered on a seemingly daily basis. In the space of a few years, hacks and security breaches have jumped from being an exceptional event confined to a special breed of technology companies to becoming a fact of life-impacting everyone. No industry is immune.

While in earlier decades office IT systems were the predominant target, these days more incidents are affecting operational technology (OT) – the programmable control systems responsible for operating machinery. The trend reflects the growing complexity of such systems and a general increase in connectivity, which in turn increases the attack surface of a vessel.

This increase is borne out in the statistics: The number of attacks on OT in 2016 was double that of the preceding year and quadruple the 2013 level. So whereas before it was mostly a company's finances and reputation that were at risk, now the threat has escalated to confront the safety of life, property and the environment. The stakes are much higher. For this reason cyber security must now be considered an integral part of overall safety management in shipping and offshore operations.

Regulatory response

Fortunately, industry policymakers have not been asleep at the wheel. The year 2017 saw two particularly significant milestones in the regulatory environment. A section dedicated to maritime security – including cyber risk – was introduced in the third edition of the Tanker Management Self Assessment (TMSA), which came into effect in January 2018, as well as in the seventh edition of the Vessel inspection questionnaire (VIQ7) from the Ship Inspection Report Programme (SIRE), effective from September 2018. Because TMSA and SIRE are imperative to gaining charters, tanker operators now have a commercial incentive to demonstrate they have given systematic consideration to potential vulnerabilities and implemented appropriate mitigations and safeguards to address them.

Shortly after, IMO's Maritime Safety Committee inserted Maritime Cyber Risk Management into the list of International Safety Management Code requirements. Strongly encouraged to start on 1 January 2021, the amendment leaves non-tanker vessel owners with little more than two years to achieve a similar level of preparedness as their tanker-owning colleagues.

Risky job

Managing cyber risk is ultimately no different to managing any other risk, remarks Svante Einarsson, DNV GL's Senior Cyber Security Advisor. "The equipment and terminology may be unfamiliar and somewhat daunting but the approach is fundamentally the same as, say, preparing for and carrying out hot work modifying a vessel's structure."

Software changes, for example, should not be done on a whim, which can often happen on ships. Because IT engineers don't frequently visit vessels, when they do come aboard to update the Electronic Chart Display and Information System or set up the latest version of a maintenance management application, the temptation is to be helpful. They click to install a new service pack and a backlog of other app updates. Nine times out of ten, this is fine. But occasionally it can

disrupt settings elsewhere on the system. Moreover, the consequences won't become apparent until long after the engineer has left and the ship has set sail.

Instead, updates should be carefully planned, tested, approved and recorded. They should be categorized as minor or major to ensure personnel with the appropriate authority can approve them. This, Einarsson says, is virtually identical to the process for gaining approval prior to carrying out welding.

Lessons learned from NotPetya

If there was one positive outcome of the NotPetya ransomware attack on Maersk in 2017, reasons Einarsson, it was the awakening of owners and operators to the fact that cyber threats are not hypothetical. "Today there is much greater awareness of the real-world implications and acceptance that cyber risk has to be tackled," he says. However, shipowners and operators are at different stages of the learning curve in formulating a response. Einarsson also observes, "Some are bewildered by the scale of the problem and don't know where to begin; others have introduced some countermeasures but are uncertain whether they've covered everything they need to cover."

In its role as a classification society DNV GL has adapted and expanded its cyber security services to assist owners and operators in protecting their assets against evolving threats and ensuring their safeguards satisfy new industry rules and regulations. DNV GL now provides services for educating and raising the awareness of all stakeholders both onshore and at sea; assessing and implementing defensive and reactive countermeasures; and monitoring and reviewing the effectiveness and robustness of barriers with an emphasis on continuous improvement.

These services are purposely designed to be non-system specific so as to work equally for conventional IT and industry-specific operational technology, which is important when systems are interlinked. This also avoids obsolescence. While the consequences of an OT outage are likely to be more serious, they can often be traced back to a weakness in IT systems, particularly if they originate from an external source.

Practical advice

In September 2016, DNV GL published a Recommended Practice (RP) to educate shipowners and operators on how to deal with cyber risk. "It was designed to demystify a subject the industry was still getting to grips with. We took care to write it in a maritime language and context," stresses Einarsson. The focus was on practical steps. "Most advice coming from industry bodies at the time, while produced with noble intentions, was very high-level. Our idea was to close the gap between theoretical concepts and the real world," he underlines. For example, DNV GL's RP accounts for common constraints such as limited budget and resource availability. The core approach is to identify weaknesses, assess their severity, then prioritize the most serious ones. The RP has been released as a free resource.

The next step for vessel operators would be to carry out a cyber security assessment. DNV GL can support this by sending interdisciplinary teams to help on- and offshore personnel identify and address specific business risks. "While operators typically understand the written guidance, translating those principles into action is sometimes more challenging," notes Einarsson. This collaboration results in a highly methodical approach to developing effective risk mitigation procedures that mesh neatly with the operator's structure and working practices. Apart from closing cyber security gaps by technical means, this appraisal also considers system management and the human factor.

Once countermeasures and a new risk management regime have been implemented, they can be followed up and qualified by penetration testing. "Testing the robustness of barriers is essential to ensure that assets are secure and nothing has been overlooked," explains Einarsson. In this process, authorized "white-hat" hackers do their best to compromise the IT and OT defences to validate that safeguards work as they should and risks have been eliminated.


Photo: DNV GL

Scan the code to download DNV GL's Cyber Secure class notation

Scan the code to obtain your copy of DNV GL's Recommended Practice on cyber security resilience management for ships and mobile offshore units in operation

Scan the code to watch DNV GL's video about cyber security awareness

DNV·GL

The Høvik-headquartered DNV GL is a classification society and accredited certification body. Since its foundation in 1864, DNV GL's purpose has been to safeguard life, property, and the environment. Today, the organisation is structured into five business areas: Maritime, Oil & Gas, Energy, Business Assurance, and Digital Solutions, alongside a Global Shared Services function and Group Centre. For more info please click www.dnvgl.com

Life cycle management

DNV GL also provides third-party verification of cyber security requirements throughout the newbuild project life cycle. "Our cyber security team recently worked with a major cruise line on devising a process for embedding cyber resilience from the very beginning of the vessel design phase," reports Einarsson. This was accomplished by introducing defined risk handling and accommodating procedures to all stakeholders in the project – not only the owner and yard but also the vendors. Incorporating technology and systems from third-party suppliers unavoidably adds complexity to a project and, from a cyber security perspective, increases potential exposure to malevolent actors. Meanwhile, shipyards are as much on the learning curve as vessel owners.

"For a large, sophisticated vessel like a cruise ship, which is dependent on technology for both operational and hotel needs, collaboration is absolutely critical," Einarsson stresses and then adds, "Cyber risks are multifaceted. The response has to mirror that. Everyone has to be involved in the conversation, because, as the saying goes, a chain is only as strong as its weakest link." The feedback from the project, he notes, was overwhelmingly positive, "Tackling cyber security right from the beginning of a vessel's life cycle enables stakeholders to take a proactive, rather than reactive, approach to the problem. It provides more opportunities to insert barriers."

Based on these advisory services, DNV GL has developed its first class notations covering cyber resilience. The Cyber Secure notations have three qualifiers: Basic, Advanced and "+". Basic is primarily intended for ships in operation; Advanced is designed to be applied throughout the newbuilding process. The '+' qualifier is available for systems not covered by the scopes of Basic and Advanced. Furthermore, DNV GL has introduced a Type Approval scheme to verify and test the cyber security reliance of components. The utilization of these reference standards ensures state-of-the art cyber security based on the 62443 standard of the International Electrotechnical Commission. The standards are applicable for the whole life cycle of a vessel from the perspective of manufacturers, yards and shipowners.

The human element

Of course, cyber security is not just a matter of firewalls and antivirus software. Up to 90% of incidents are attributed to human behaviour. Phishing and social engineering, unintentional downloads of malware, etc., remain common issues. At the same time, most crews and onshore staff are not taught how to respond to cyber attacks or major technology failure and consequently fail to contain the damage.

DNV GL has therefore expanded its options for training through its Maritime Academy. Courses cover cyber security from both management and technical angles and even include lessons in hacking to give participants an insight into how cyber attackers operate. Additional new tools incorporate friendly phishing campaigns and simulations of other social engineering techniques as well as features for assessing staff alertness so customers can fine-tune the level and frequency of cyber awareness training.

DNV GL can help vessel operators combine traditional IT security best-practices with an in-depth understanding of maritime operations and industrial automated control systems. DNV GL understands the importance of tackling and integrating the human factor when devising and implementing a cyber risk management strategy because ultimately, it is people who drive our industry. ■

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Photos: Rawpixel

Making the hackers' job hard

by Claus Herbolzheimer, *Partner and Head of Digital, Technology & Analytics in Germany & Austria,*
and Max-Alexander Borreck, *Principal, Transport and Logistics, Oliver Wyman*

When the Danish shipping giant A.P. Møller-Mærsk's computer system was attacked on June 27, 2017, by hackers, it led to disruption in transport across the planet, including delays at the Port of New York and New Jersey, the Port of Los Angeles, Europe's largest port in Rotterdam, and India's largest container port near Mumbai, according to reports. That's because Maersk is the world's largest shipping company with 600 container vessels handling 15% of the world's seaborne manufactured trade. It also owns the port operator APM Terminals with 76 port and terminal facilities in 59 countries around the globe.

For the transportation and logistics (T&L) industry, the June 27 cyber attack is a clarion call to elevate cyber security to a top priority. Besides Maersk, press reports said other T&L industry giants were affected, including German postal and logistics company Deutsche Post and German railway operator Deutsche Bahn, which was also a victim of the WannaCry ransomware hack in May the same year.

While up until now hackers have seemed more preoccupied penetrating computer systems at banks, retailers, and government agencies – places where a hacker can find access to lots of money and data and create substantial disruption – the most recent ransomware attacks demonstrate that the T&L industry is now on hackers' radar.

What is the Darknet?

Part of the increased interest in the industry is because of its own efforts to digitize. Over the past couple of years, the industry has been in the process of automating systems, turning paper into digits, and using advanced analytics to stay on top of needs of their customers. That has put more systems online and vulnerable to various attack weapons now so readily available on the Darknet – the hidden underbelly of the Internet where hackers, terrorists, and criminals cavort anonymously buying malware, stolen data, arms, and drugs.

The early, more obvious targets have upped their game in cyber security, and hackers who are relentless look down the chain for new avenues of entry. Hacking also has become not only a corporate business, but a nation state's business. Here, nation states are looking for places where things are crossing borders regularly and for access to major industries and public infrastructure, such as the airports and ports that T&L companies operate.

The T&L industry also has characteristics that make it a particularly tempting target. First, the industry is a global one with tentacles into so many different industries around the world. Complex logistical chains are created around manufacturers, and often logistics companies are embedded within production facilities controlling inventory and handling on-demand needs of a plant.

Simultaneously, the industry is fragmented with large T&L giants working alongside tiny companies responsible for one short leg of a product's long journey from raw materials, to production, to retailer, to consumer. This almost always means multiple technology systems are being employed, and multiple cyber security procedures of various degrees of rigor being followed. This fragmentation provides more opportunities for hackers.

Looking for the weakest link

Like with all forms of warfare, attackers will seek out the weakest link in any chain – the most vulnerable element – as a target. Why steal money from the bank with all its infrastructure and protections when you can steal it on the way to the bank? While efforts to protect it along the way are made, almost any criminal could tell you, it is almost always more insecure in transit.

We already see malware that allows for hacking of delivery robots and parcel lockers. Drones can be hacked as well

as autonomous cars, and as these are used more and more for deliveries the potential for hijack increases. Drones could be flown into no-fly zones posing the possibility of attacks on planes. When we reviewed the Darknet, we found personnel data from a major T&L company, car entry hacks, and means to create a fake parcel station identity.

Until now, the T&L industry has not prioritized cyber security except in cases where life was on the line, such as with aerospace manufacturers or airlines where the most sophisticated protections are used. But the direct costs from cyber security breaches are growing exponentially, and companies – even small ones – need to invest in new systems and more comprehensive risk management. By our projections, they can be expected to grow from $1.7b in 2015 to more than $6.8b by 2020. No industry will be entirely safe from the threat of cyber attacks.

Bringing security to fragmentation

The industry's fragmentation and its requirement to operate within the various IT systems of its customers makes figuring out cyber security solutions more challenging and has led to lower investment. The industry also operates on low margins, making extensive capital expenditure on cyber security unattractive. That may be offset by the potential liability costs from hacks.

Increasingly, shippers and regulators will require T&L companies to guarantee the integrity of product and transport data, as well as ensure compliance with stricter cyber security laws. This will include carriers and forwarders, who are assuming central roles in supply chains as hubs for data exchange, making them high-value targets.

Taking precautions by installing security systems, such as firewalls and detection systems for denial of service attacks and other malware, is crucial, but insufficient by themselves. Cyber risk management also needs to take into account personnel and organization failure.

Ultimately, adopting proactive cyber security risk management provides an opportunity for T&L companies to differentiate themselves. Forward-looking companies will begin to see a safer logistical offering as a competitive advantage, especially if the attacks continue.

In the end, no industry will be entirely safe from the threat of cyber attacks. But every industry must do its part to at least make the job of hackers hard. ■

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Photo: Pxhere

The enemy within

by Mark Rodbert, *CEO, idax Software*

It seems that the peak of data breaches is upon us, with a different story hitting the headlines each day – although I've been saying that every year since 2015. When imagining where the threat is coming from, most people picture a hooded hacker in a dark room or a state-sponsored covert operation. As a consequence, most organisations are focussing their defence on implementing solutions to prevent intruders from getting in, relying heavily on solutions such as firewalls or antivirus protection. But what about the people who are already in and pose a threat to the internal security of the organisation?

It turns out that the real threat lies a lot closer to home, with 66% of organisations considering malicious insider attacks or accidental breaches more likely than external attacks, according to the 2018 edition of the CA Technologies' *Insider Threat* report. Whether they are the result of bad actors attempting to sell sensitive company data, collusion, or unwitting accomplices using a work laptop on a Starbucks Wi-Fi, most breaches are simply a matter of access and opportunity.

Ultimately the outcome is the same, whether the intent is malicious or not. But, if we can identify who has access to what data and applications, and which of these are out of the ordinary, maybe there is a way to prevent internal threats after all.

An inside job

Clearly, an external threat is still a priority for businesses, and it's no surprise with many well-known enterprise businesses, like T-Mobile, Facebook, and Google, all facing damaging external cyber breaches last year. Yet, this shouldn't distract companies from the internal threat, which can be just as damaging; *Insider Threat* reported that 90% of organisations feel vulnerable to the insider threat, and the majority of employees have access to data they shouldn't. However, an insider threat becomes an external threat when compromised access is used by unscrupulous attackers. By tightening up the internal security vigilance, controls, and access processes, external hackers will find it harder to break through and entice staff with a phishing email.

So what can businesses do to start building their cyber defence to insider threat? Unfortunately, the answer is not as easy as simply implementing a new security system or process. Companies need to recognise the need for a cultural shift and change in attitude, to the point where everybody in the organisation understands that cyber security is their responsibility. In order to change the culture around protecting assets, organisations need to make everyone – from the CEO to the person at the door – feel responsible, involved, and empowered, putting employees at the front of the fight. This requires building tools not just available to the IT security department but targeted at the whole organisation.

However, we're discussing a transformational change which won't take place overnight but over a significant period so that each individual comes to recognise the part they play. The first phase of this is access management being the job of specific security teams. The issue here is

that employees feel as though it's a job for the security or IT team, and has nothing to do with them.

The next phase, which is becoming increasingly widespread among organisations, is steering away from having just the security team tackle the cyber issue and instead putting line managers in charge of access rights. Currently, this often involves the line manager having to deal with a highly complicated, confusing access details spreadsheet, with no context or explanation about what in the list refers to what data and what files are required for a role. Moreover, the risk with reviewing access to assets is asymmetric. If access to something that an employee does need is taken away, there is a very high chance of a small issue. However, if somebody keeps access to something they shouldn't have, there is a very small chance of a huge breach. Human beings need help comparing these risks.

In the long run – the eventual third phase of this shift – companies can look to become part of the security revolution that will see everyone in a company self-certificating their own access rights, with oversight and ultimate approval from line managers. With an engaging, end-user-friendly user interface, employees are encouraged to take responsibility for their own actions and aim to be as secure as possible.

Scan the QR code to directly access the 2018 edition of the CA Technologies' Insider Threat *report*

Step your cyber skills up now!

2019 is looking like it may be the year for organisations to finally take a step back – or in fact, step *up* – and analyse their own internal security measures. The internal threat is and always has been overlooked as a significant cyber threat. Why wait any longer to crack down on your internal security? By implementing software to manage access rights, employers can start their journey to change company culture towards security immediately. ■

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Using identity analytics, idax is the world's leading company in automatically analysing the access rights for an organisation, quantifying the risk, and determining who has excessive access requiring adjustment. Protecting digital information is critical for modern companies. Most cyber fraud is committed by employees. As technology becomes more complex, knowing whether or not someone should have access to systems is beyond the capability and knowledge of managers and traditional systems. What is required is a new approach. Using proprietary algorithms, idax enables organisations to manage access changes in real-time, making it possible to dynamically enforce the principle of 'least privilege'. For more information, please visit www.idaxsoftware.com

Photo: Wikimedia Commons

A long way to go

by Peter Broadhurst, *Senior VP of Safety and Security, Inmarsat Maritime*

Whether in pursuit of personal data or money, cyber crime is now a big and highly automated business, ready to strike at the most vulnerable part of an organisation's defence 24/7, anywhere in the world.

As a case in point, speaking on a panel at the World Economic Forum earlier this year, Jim Hagemann Snabe, Chairman, A.P. Møller-Mærsk, revealed that responding to the NotPetya ransomware attack of June 2017 had required the reinstallation of 4,000 new servers, 45,000 new PCs, and 2,500 applications, all within ten days. During this period, the company reverted to manual systems. In hitting a company equipped with experienced cyber security specialists, NotPetya showed that the cyber threat is as real for shipping as it is for any other connected business, especially where legacy systems proliferate.

Cyber ambivalence

If the warning should be sinking in, an Inmarsat Research Programme report from 2018, *The Industrial IoT on land and at sea*, suggests that maritime minds are slow to change. The unique study drew on testimony from 750 survey respondents across a range of industries to establish preparedness and perceptions regarding the adoption of solutions based on the Industrial Internet of Things (IoT).

The survey found 87% of maritime respondents saying they believed that their cyber security arrangements could be improved. It also saw more of them identifying data storage methods (55%), poor network security (50%), and potential mishandling/misuse of data (44%) as likely to lead to breaches in cyber security as an outright cyber attack (39%).

Given the self-diagnosis, it is perhaps surprising to find that only 25% of maritime respondents said they were working on new IoT-based security policies. In fact, Inmarsat's research exposed ambivalence as one of shipping's leading feelings towards IoT-based solutions. With some owners engaging at the level of blockchain, others take their lead from their need to comply with regulation: this is an industry which simultaneously sustains just over 30% of shipping respondents as 'IoT leaders' and just under 30% as 'IoT laggards,' the report says. For every owner signed up to the benefits of condition-based monitoring and predictive maintenance based on real-time connectivity, there appears to be another for whom maintenance is something that takes place at regular and predictable intervals, or whenever is most convenient.

Inconsistent views on cyber security also appear free to coexist with immature ones. Around 70% of respondents identify reducing marine insurance premiums as the main driver for IoT uptake, where insurers have shown themselves as especially sensitive to cyber threats. At the same time, other studies have found attitudes such as "I'm not the target/we have security in place, don't we?/I will be protected by AntiVirus" alive and well among seafarers.

How to maintain integrity

For those prepared to engage in the IoT, today ships sustain crews in small numbers, representing both an opportunity and challenge for automation, and indeed for cyber security. On the one hand, low crew numbers align strongly with operational technology (OT) that is remotely updated, self-managing, and supported by automated security and from third parties and OEMs, such as voyage planning, weather routing, navigation, fuel management, etc. On the other hand, the opportunities to 'patch' embedded OT safely are not frequent, and patches usually require certification by control system manufacturers.

The broader point, though, is that cyber security is not just about software patching and system configuration. Ship operators do not buy computer processors, disk storage, and software, and then build them into a system: they procure turnkey systems. Again, shipboard engineers may well be IT-literate, but no space has been made on the crew roster for cyber security specialists.

In these circumstances, the integrity of the systems on ships is best maintained by software which can identify, contain, and resolve threats wherever they appear in the network. Such Unified Threat Management (UTM) detects all deviations from the 'known good' configuration as anomalies and potential threats to security and can update securely, even during operation. Some specialised functions,

such as an in-depth analysis of alerts or security forensics, will need to be delivered remotely.

Inmarsat believes that a collaborative approach – that includes shipboard systems as well as the crew operating them and the processes involved – is vital to develop the maturity response demanded by multiple threats from cyber villains, whatever their origin. For this reason, we have been working with some of the best security-focused experts available, to tailor products and services to meet the shipping industry's requirements. Our work with Trustwave, a cyber security subsidiary of Singtel, for example, has brought Fleet Secure into the industry as the first independent service designed to detect vulnerabilities, provide alerts, respond to threats, and protect ships from cyber attacks. In fact, Fleet Secure is a UTM, available without additional outlay on hardware which also has no impact on contracted bandwidth. It can identify external attacks through high-speed broadband connectivity, including malware introduced accidentally to the ship's local area network. It then isolates that part of the operating system infected to prevent wider disruption.

What makes for good cyber security practice

However, software is only part of the answer: cyber security and vigilance for 'the human element' and a well-thought-out recovery strategy to mitigate against multiple, automated assaults are also critical. Process failures and mistakes made by people can present the security loophole that, if unchecked by the UTM, can compromise the entire network. Weaknesses in the first line of defence (to phishing, plugging in an infected USB, downloading from an unreliable source, etc.) are common, but in the case of satellite-connected ships, it is also common to see updates turned off and no antivirus software in operation. Today, cyber security training is not compulsory for the world's 1.6m seafarers, while expertise in antivirus software is inevitably more likely to be based ashore.

As far as awareness is concerned, it is fair to say that there is likely to be more temptation to risk plugging in a memory stick that might be infected once a vessel is underway. Creating awareness for seafarers and staff is a continuous task because good cyber security practice is the shipping's first line of defence against a cyber intrusion.

Inmarsat has recently participated in discussions with academics at the World Maritime University in Malmö over what future classroom-based and e-learning cyber security course content might include for Maritime Safety and Security Diploma students. While Inmarsat is not and does not aspire to be a training company, it is, nevertheless, an interested party that's very much concerned with what's happening in the cyber domain. As such, we are fully aware that training is not just a tick box exercise and must be backed up with monitoring and reinforcement. We also know that using tools to identify breaches of policies, such as USB usage, help reinforce the message: constant reminders and real-life examples are often the quickest ways to stop a bad practice.

But to address future cyber security risks effectively, we need the involvement of ship designers, builders, regulators, verifiers, equipment manufacturers, service providers, and, of course, owners and operators. We were, therefore, one of the founding partners in a Joint Working Group run by the International Association of Classification Societies (IACS) whose members survey and certificate more than 90% of the world's commercial vessels, ensuring that ships are fit-for-purpose and comply with safety and quality regulations. The Working Group, which includes representatives from across the maritime sector, has developed a cyber security framework that is likely to form a basis for risk management that will contribute to future seafarer training requirements and the International Maritime Organization's International Safety Management (ISM) Code, a standard for the safe operation of ships. A further outcome is likely to be a recommendation relating to how a cyber security module can be best integrated into standard seafarer training courses, probably as part of the Standards of Training, Certification and Watchkeeping (STCW) Code.

For its own part, Inmarsat does issue guidelines covering best practice, but it is also evolving capabilities that support greater cyber maturity in the seafaring community, most recently through Fleet Secure Endpoint and Fleet Secure Cyber Awareness. The first of these has been developed together with digital security specialist ESET and is powered by Port-IT to protect desktop computers and other devices connected to shipboard networks and has been available since the beginning of 2019. Fleet Secure Cyber Awareness, meanwhile, has been developed in collaboration with Stapleton International and the Marine Learning Alliance to help seafarers educate themselves on the possible tactics that cyber criminals can use to infiltrate a company's IT infrastructure.

Over the line

There is no doubt that digitalisation and new smart technologies are transforming ship operation at an exponential pace, but Inmarsat's view is that to accelerate this transformation all stakeholders interested in optimising the efficiency of ships and crew welfare must exert themselves if the industry is to be carried over the line.

This means we must not only be training our seafarers more effectively, better managing our processes and protecting our systems but nurturing awareness of best cyber security practice, even on vessels that have little or no cyber security protection at all. Clearly, there is still a long way to go. ■

inmarsat

The mobile satellite company

Inmarsat was set up in 1979 by the International Maritime Organization to enable ships to stay in constant touch with shore or to call for help in an emergency, no matter how far out to sea. Today, the company's fleet of 13 satellites serves not only the needs of merchant shipping but also governments, humanitarian aid agencies, airlines, the broadcast media, and the oil & gas, mining, and construction industries. For more info, please click www.inmarsat.com

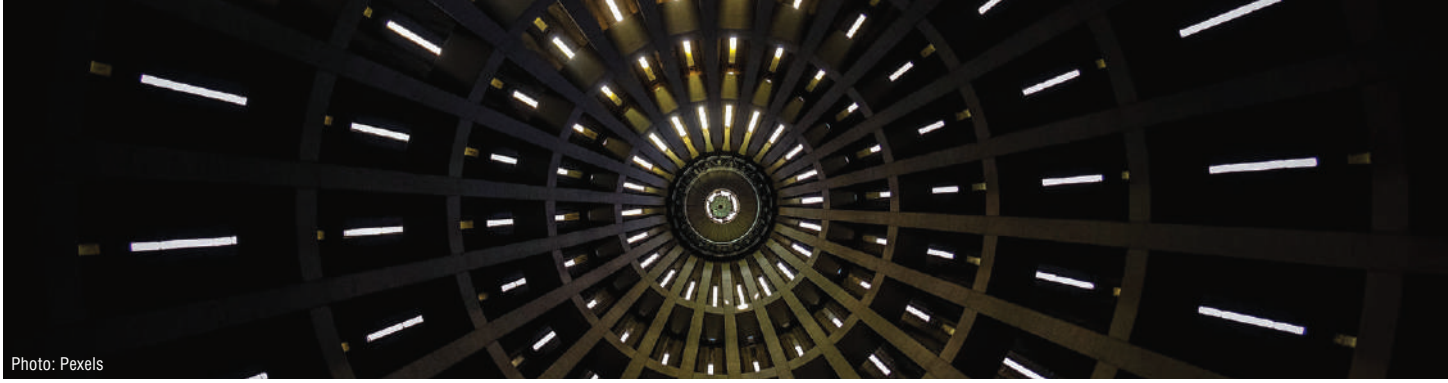


Photo: Pexels

The cyber security seal

by Przemysław Myszka

Naval Dome is an Israel-based cyber security specialist providing security detection and protection solutions to the international maritime industry. The multi-award-winning Naval Dome solution is the first maritime multi-layer cyber defence solution for mission critical on-board systems. For more info, please visit https://navaldome.com

One could almost perceive it as a miracle that the world continues to spin, following all the breaking news on cyber attack, scams, and scandals that cost the global economy billions of dollars each year. Coming increasingly more to the cyber limelight is the transport and logistics industry, until recently somewhat unmindful of the consequences of being too cyber-remiss. We're talking to Itai Sela, the man behind setting up Naval Dome, about the maritime industry's awareness of the threat, what's in the perpetrators' malicious toolbox, and what his company has in store to blunt the potential intrusion.

■ **What's the company's story – why was it established and what are its main goals?**

I'm a former Israeli Navy officer. During my 25 years' service, I recognised a potential security blind spot in the maritime industry, believing if someone can breach a security facility eight floors underground, then it cannot be very difficult for someone to breach a vessel at sea. When I shared such thoughts with the commercial maritime industry, they initially resisted. "The vessel is like an island," they said. "No one can hack a ship!"
Despite that reaction, my team and I were undeterred and looked at developing the optimum maritime security solution, drafting in some of the brightest minds in naval intelligence and cyber security with whom we established Naval Dome. To show the industry the extent of the problem the Naval Dome team first carried out ethical cyber attacks on live navigation, engine, and other machinery control systems, succeeding in attacking different electronic systems from different manufacturers. The breach was carried out in the same way in which a hacker would operate. However, the difference was that the operators and system manufacturers knew of the "attack." Had an actual hacker carried out the same intrusion, they would have had no idea.

■ **What's in the company's portfolio? Specifically, what is the multi-layer cyber defence solution for mission-critical on-board systems?**

What Naval Dome discovered from these carefully managed attacks was that there wasn't just one blind spot, there were many. A lot of the systems were unprotected. It was at this point that the team and I began developing the Naval Dome Endpoint solution to deliver the highest level of cyber security for all floating assets. Earlier this year, the company's Secure Endpoint product achieved

the highest level of security certification/type approval, Security Level 4 (SL4), from the classification society DNV GL.The Naval Dome solution is a two-step, multi-layered cyber protection system. The first stage, the Secure Endpoint, prevents internal cyber attacks by replacing the on-board systems' hard disk with the Endpoint "hard disk." Once installed, the ship's system functions in the same way, but it's now secured to SL4 grade protection. It can work with different operating systems, including Windows and Linux.

The system also ensures ship operators can assess the security of all systems that have been installed with Endpoint. The Secure Naval Dome App and Dashboard indicated what systems are protected, those that have detected and protected against intrusion, and real-time security monitoring/alerts for the ship and shore personnel.

The second aspect of the Naval Dome solution is the Secure Naval Dome Cloud. This protects all data delivered to and from the vessel and prevents external cyber attacks. What Naval Dome has done is integrate its own Secure Cloud with the customers' existing Cloud-based infrastructure so only the client's "cloud" is needed.

Today, I can proudly say Naval Dome is the leading supplier of multi-layered maritime cyber defence and analytical solutions. To date, we have secured the PC-based systems on-board a significant number of commercial vessels and super yachts. Naval Dome is working with leading original equipment manufacturers (OEMs) to help protect their systems in a way that it becomes an integral part of suppliers' existing and new software. The OEMs are now integrating the Naval Dome software with the systems to provide their customers with the utmost protection. This is much easier for end users as they only have one point of contact – the OEM – to provide all the service and support. In recognition of our works, we've won several industry awards, including the Marine Propulsion Marine Intelligence Award 2018, Lloyd's List Cyber Security Innovation Award 2018, and the Seatrade Cyber Security Award 2018.

■ **What do cyber criminals have in store to target the shipping and port industries?**

Typically, cyber criminals will use malware or ransomware-type viruses capable of infecting complete ship networks, and operators will be unaware until the virus has been activated. This is because many of the systems are based on old operating systems and designed and manufactured without considering the cyber risk.

There are two main threats: untargeted and targeted attacks. The former is when someone attacks several companies at once, and the virus spreads until it finds an unsecured network. The latter, in turn, is when specific companies or industry sectors are infected directly.

An attack can be successful when operators make a mistake and inadvertently upload an infected file, e.g., by opening an email or connecting an infected file. This creates connectivity. The second way is when an OEM or technician is attacked, and the infected files are inadvertently spread during system updates or servicing. The second method is more effective in spreading a virus.

■ **How the shipping industry reacts to (cyber) security threats?**

Unfortunately, the industry has been slow to react, relying mostly on operator training as a precautionary measure. However, reliance on the human factor in the cyber protection cycle is not the answer.

There is also limited control over the vendor's maintenance, updates, and test equipment which could, if they aren't properly protected, inadvertently infect the network. Typically, most networks are not segmented, so if an attack has been detected in one area of the network, it usually means the entire system is infected.

Another aspect that impacts the security of ship systems is that there are no mandatory requirements, only guidelines. There should be binding instructions.

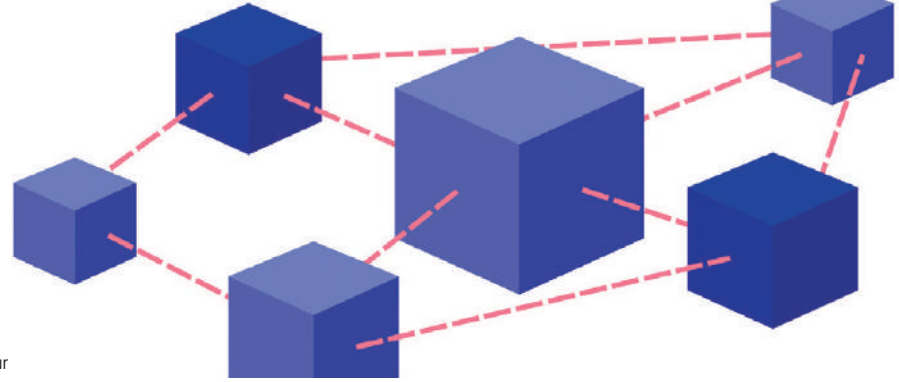
■ **What's the company's take on the so-called cyber clause introduced by BIMCO? The clause will require, "[…] the parties to have plans and procedures in place to protect their computer systems and data, and to be able to respond quickly and efficiently to a cyber incident."**

The BIMCO cyber clause is very much a move in the right direction, but this does need to be adopted widely. Maritime insurance companies also need to develop consistent and comprehensive maritime cyber insurance policies and remove the CL380, the clause that removes any insurance relating to computer-based problems.

Every ship system should be protected to SL4 as well as implement the BIMCO guidelines. Ship operators should also segregate their operational (OT) and information technology (IT) networks. The problem is that these are often connected. There is no real network segmentation. This is very important.

■ **What's the company's outlook about how the shipping business will tackle the cyber threat in the near future?**

We encourage more and more OEMs to integrate the Naval Dome solution with their systems and equipment prior to delivery to their customers. This way, both the OEM and the end user are confident that their systems are protected at the highest level from the outset. This also means that the end user no longer has to worry about cyber protection as the OEM provides the requisite services and upgrades that are protected by Naval Dome. In the future, all equipment could have the Naval Dome "seal of security," to show that such and such equipment is "Protected by Naval Dome."



Photos: TOC Eur

The trust factor and human error in supply chain security

by Marcin Lewicki, *CEO & Founder, Sternkraft*

The global supply chain network is a system of self-existing individuals connected to each other in an undefined way. Information goes from one organization to another according to rules that aren't specified globally. In most of the cases, two cooperating organizations have their individual methods of exchanging information – analogue, like paper invoices or certificates, or digital such as the state and the position of the transported cargo. Sometimes organizations agree to use the same processes, procedures, and tools to exchange data. This, however, doesn't mean they all have the same internal rules. These companies store our data, so it's crucial for us to know if our partner has put in place the proper internal rules and processes thanks to which the data infrastructure is safe. The question arises: can we take the human factor out of the 'trust equation'?

We all know that one thing is to gain a certificate, but actually sticking to the rules is another pair of shoes altogether. The latter is undermined by factors such as trust and human error. Is working with Maersk a safe option? It should be. Why? Because the Light Blue means something in the industry. I know I can trust them.

One hard drive to save them all

Yet, I'd be very surprised back on 27 June 2017. Such a respectful and well-certificated corporation, with a lot of great minds on-board, was hacked by a piece of malware that wasn't even targeted at Maersk in the first place! The fallout was nothing short of epic – no more no less, but the giant went analogue for two whole weeks. Conclusion? One cannot simply take trust on, well, trust.

It's hard to say what was Maersk's main shortcoming back two years ago. Surely they weren't prepared for what happened. What we know now, though, is that the whole company was using systems that weren't upgraded with the latest patches while passwords were of really low complexity. End result? One small NonPetya malware destroyed the entire infrastructure. Like in an action movie, Maersk survived because they were able to retrieve the single last copy of their system that wasn't hijacked – in Ghana. For comparison, all – all! – of their 150 domain controller backups were down. At that time, it was the most important hard drive disc for the entire container shipping industry. Mission – get to Ghana and bring that HDD to England. One existing backup server rescued the whole 45,000 computers and 4,000 servers-big company.

So, even if I had trusted Maersk – the incident would affect me. Making simple Windows updates and having to go through two-factor authentication on each and every computer – this would have saved Maersk $300m that summer. But it isn't


Photo: Sternkraft

that the Danish conglomerate is the only whipping boy; other heavyweight players also lost millions because of the NotPetya attack. Merck admitted to their shareholders they lost $870m because of shutting down the ability to manufacture drugs. The French Saint-Gobain, which delivers construction and high-performance materials, saw $400m going down the pipe; FedEx – $400m; Mondelēz, the manufacturer of i.a. Cadbury chocolates – $188m; Reckitt Benckiser, the British producer of Durex condoms – $129m; and so on and so forth.

One, big, decentralized, yet shared by everyone shipment registry

What if we could grasp human trust with a mathematical formula? Imagine a situation where you know exactly where your shipment is; what is the temperature inside the container; whether somebody has tampered with the seals; opened the doors; or even stolen the entire unit. Carriers, suppliers, intermediaries, insurers, regulators are involved in the supply chain, meaning there's plenty of room where communication, data transparency, and safety can be compromised.

SAP, Oracle, Salesforce – they all work on cloud-based solutions to improve freight and order management, transportation planning, costs, reporting, and analytics. What if we could use one big database to identify and track each cargo globally? What if we could allow access to this database to everyone and, while using it according to the rules, change the registry of each transport in time? What if we create one, big registry of shipments, totally inaccessible for unauthorised parties?

The so-called Distributed Ledger Technology (DLT) – better known as blockchain – provides such a global format. It's interoperable, immutable, and secure. It's a data standard that's accessible by authorized parties and cannot be changed. Each transport's ledger is shared by many, delivering a decentralized database that's synchronized by each member. Blockchain cryptography and smart contracts make rules visible to everyone and used by everyone, but data are only accessed by those who own a "password." Such a database and interface layer allows connecting any end-user application to it. Decentralization, which stands for immutability and having a synchronization backup strategy, helps to secure the data. The role model to follow is Samsung SDS, a member of the Transported Asset Protection Association, and its ongoing project with the Port of Rotterdam and ABN Amro Bank. "Our blockchain based project is the answer to the cyber security of our times. It will secure and improve freight processes like nothing before," says Jacques De Smit, Regional Logistics Director, Samsung SDS.

Secure the future

In Sternkraft's Internet of Things project called Safeway, a test DLT solution, is being implemented. Safeway is a solution that combines hard- and software and allows monitoring goods in both curtainsider and semi-trailers, and doing it in- and externally. All algorithms implemented in our cameras help to prevent thefts. The alarm is activated whenever something strange is happening, e.g., someone is next to the cargo and behaves suspiciously, or the temperature inside the unit changes rapidly. BinarApps creates a management system for logistics to monitor transport and generate an alert if any unwanted situation occurs. Each transport ID number with its attached documentation will be stored in a partially public DLT database. Each of the Safeway's users will be the owner of at least one copy of the database node. Nodes are synchronised and, thanks to cryptography, 100% valid. This way they'll participate in creating a decentralized copy of what could be called the data centre's heart.

Maersk is probably well-secured by now. The management board took up the challenge and started to treat cyber security seriously. Meanwhile, blue chip companies need to take on the responsibility to not only secure the present, but also the future. There's a way of feeling more cyber comfortable, as long as it's called blockchain. ■

STERNKRAFT
TELEMATICS

The business of transport and logistics suffers from growing numbers of threats like cargo and fuel theft or burglary. This has led the Berlin-headquartered Sternkraft to develop Safeway, an advanced cargo security system that combines hardware with the latest technology. For more info, please click www.sternkraft.com/en

Photo: INFORM

When humans meet algorithms

by Dr Eva Savelsberg, *Senior Vice President, Logistics Division, INFORM*

Dr Eva Savelsberg is Senior Vice President of INFORM's Logistics Division. She specializes in Agile Optimization Software that renders a wide range of terminal processes more productive, agile, and reliable. Eva is also a lecturer at the University of Aachen (RWTH), where she received her PhD in mechanical Engineering in 2002. Eva has published four books and over 30 papers on innovation in freight transportation.

"You are my creator, but I am your master." These chilling words from Mary Shelley's novel *Frankenstein* were first published on January 1, 1818, amidst the First Industrial Revolution, a period of great social and technological change. Considered by many to be the first work of science fiction, the story influenced not only literature, drama, and film, but also the public's perception of science. This year being *Frankenstein*'s 200th anniversary, and at the dawn of the Fourth Industrial Revolution, the myth of a creature turning on its creator seems more relevant than ever before. Having escaped the laboratories of many tech companies, Artificial Intelligence (AI) is poised to change our society for good.

While human-level AI is not yet looming around the corner, we constantly carry some form of AI in our pockets already today. The irony is that Siri, Alexa, and Cortana, while comparable to the Frankenstein's monster in so many ways, aren't perceived to be frightening characters. Rather, these AI-enhanced assistants have become an ordinary, if not an integral part of our lives and workplaces.

This article will take you on a journey to the past, present, and future of AI. To unpack this story, we need to have a few stops along the way. Firstly, we need a quick reference point of what AI is and how it relates to other IT developments, e.g. machine learning. Then, it is worth identifying why INFORM is qualified to speak on the subject. From here we will explore how AI is being applied in the container terminal market today. Finally, we'll discuss what the role of humans is likely to be in the future and whether any of us will have jobs.

The simple AI-ML-OR truth

Artificial Intelligence is an area of computer science that's concerned with building systems that demonstrate intelligent behaviour. Most people find it difficult to agree on a precise definition of intelligence, so views of what AI means also tends to diverge. For most people, when they hear the term "Artificial Intelligence," they think of a General AI or a human-level AI that can mimic all aspects of human intelligence. The simple truth, however, is that today AI is far from this. Instead, AI vendors have succeeded in building niche, so-called Narrow AI systems that know how to do reasonably specific things very well (for instance, play chess, understand natural language, translate between often very different tongues, or drive autonomous vehicles). It is these Narrow AI systems that are now making their way into our industry at a rapid pace as part of the Fourth Industrial Revolution.

In contrast with General AI's goal of mimicking human intelligence, machine

learning (ML) tools use algorithms to iteratively learn from and adapt to data, enabling computers to find hidden insights without being instructed where to look. A beginner's example for this can be found in your email inbox in the form of spam filters. Simple rule-based filters are not very effective against junk mail, since spammers can quickly update their messages to work around them. Instead, ML-enhanced spam filters continuously learn from a variety of signals and tailor themselves to the email needs of the individual user.

Operations research (OR), also referred to as "the science of better", uses analytical methods (mathematical optimization, heuristic methods, and so forth) to analyse and consider vast amounts of data to optimize the planning and real-time control of processes. Depending on one's view, OR is either a means to an AI outcome or the two can be complimentary disciplines.

When you think of AI as the area of computer science that is concerned with building systems that demonstrate intelligent behaviour, one could say that OR is part of AI. From a classical research perspective, this is inaccurate because OR and AI are two separate disciplines that have independently developed intelligence-based computing techniques. However, if one takes the broader definition of AI, with building systems that demonstrate intelligent behaviour, OR could be classified as a part of AI. Alternatively, AI is a technique that makes better predictions about the data that is fed into OR optimization algorithms.

Either way you choose to view the relationship between OR and AI, INFORM has been working with AI for over two decades, with commercially available products in use since the early 2000s. More than 20 years ago, we started developing knowledge-based AI systems pertaining to the concept of using fuzzy logic and fuzzy reasoning for representing human knowledge. Over the years, we've added ML as a second area in our AI activities and the two are now working together in parallel.

What's in it for my container?

As described in another place, in the article Power up your TOS published in *The Journal of Port and Terminals*, our OR-based Optimization Modules (OMs) work in conjunction with an existing terminal operating system (TOS) to drive terminal efficiency. This "add-on" relationship allows terminals to implement the power of OMs without significant changes. Further, in most cases OMs work in the background without direct user interaction. Workers interact with their existing software environment while benefiting from optimization with no timely retraining required.

To further enhance the decision-making quality, the same add-on relationship can be used to connect a ML platform to the optimization process. There are basically two use cases. First, to analyse data to fine-tune the models and rules of the OM. Second, to analyse data to improve data quality that is fed into the OM.

Optimization Modules typically run on a mixture of different data, e.g., estimated time of arrival/departure of trains and ships, the travel speeds of automated stacking cranes or rubber tyred gantries, container bookings, and truck gate-in registration. Some of these are often based on average or historical values, like the times of truck check-ins or incoming trains pre-checks. While this level of quality is sufficient to make the best-informed decisions, values offering higher precision at this stage can improve the calculations. Here's an example: a time slot management system provides shippers the ability to book allocated inbound arrival time slots. However, delayed deliveries are commonplace and actual truck arrival times may vary over the course of a business day (off-peak vs. high-peak). In fact, they may vary on different weekdays, be affected by weather conditions, or even be different for particular hauliers and/or drivers.

The ML will analyse huge amounts of data very quickly and present any findings and correlations in easy-to-digest dashboards to create insights for humans. These, in turn, can form the basis for expert discussions. In cooperation with INFORM, the outcome can be used to fine-tune the models and rules of the optimization module or, alternatively, the insights from ML may be fed back automatically into the software where they replace previous average or historical values.

Besides data from the TOS and OMs, ML can also be connected to various other internal and external data sources (port community systems, weather apps, etc.) to further enrich the database. Machine learning can be operated all day round,

Photo: Wikimedia Commons

or on a periodic or on an event-triggered basis.

Is it alive?

In the riveting laboratory scene when the monster is brought to life, Victor Frankenstein shouts, "Look! It's alive." Today, computer programmers can have similar moments when they develop chatbots. In fact, these pieces of code are one of the most common AI-based applications. They are designed to sound and type like human beings and continuously learn and develop through AI and ML.

To make the latest technologies and applications available for the terminal industry, INFORM recently released a chatbot add-on for their maritime and inland terminal solutions. It receives both voice and text-based queries from a broad range of input sources, recognizes the request, searches for the answer, and sends the answer back as a text response in real-time. The chatbot quickly allows a status check of key performance indicators (KPIs), containers, and/or equipment without calling anyone. Management, with no previous training in the system, can ask the software directly to quickly access KPI data on the fly and in a manner that is convenient to them.

Frankenstein reloaded?

Two hundred years later, we find ourselves at a prologue to a new Frankenstein story. What are the lessons learned? One of Dr Frankenstein's gravest errors was to neglect his creation. He fled from its presence, giving up on the opportunity to supervise, nurture, and educate his invention. Today, the aim of AI development should not be to make a "digitized being" better than us, but rather to make "it" beneficial to us.

Technology moves ahead, but so does the human mind and our attitude towards technology. A senior operations manager from the baby boomer generation might have a different opinion on the usefulness of chatbots compared to a millennial management trainee. Also, a seasoned straddle carrier driver will be more hesitant to accept decisions and work orders from an AI system than a digital native who is about to start a career in our business.

By 2025, Millennials will make up 75% of the global workforce. They have grown up with very fast communication capabilities and high-tech is woven into all aspects and areas of their life. What's more, the generation born after 2010 – the "AI natives" – will only know a world with artificial technology (read more in the article *Born digital. Millennials in maritime logistics*, featured in the 1/2018 printed edition of the *Harbours Review*).

How we manage this human transition is going to define our industry. At this point, there are more questions than answers, such as how do we best utilize highly skilled staff who are in traditional roles? How do you prepare these staff for the future and how will their roles change? If we retrain them, who bears the financial and social costs? How do we attract a young, millennial-aged workforce that have the new skills we'll need in the future (find out more in the piece *How to hire – and keep – the best. Employee experience* in the same printed issue)?

To position ourselves for the future, it is the role of all stakeholders in the port industry to take a degree of responsibility. The question isn't whether AI is coming or not, but rather will we, as an industry, finds ourselves well-prepared or maybe rather caught off-guard when we realize that AI is here. Or, as Mary Shelley wrote in *Frankenstein*, "Nothing is so painful to the human mind as a great and sudden change." ■

INFORM

INFORM specializes in Agile Optimization Software to improve operational decision making. Based in Aachen, Germany, the company has been in the optimization business for nearly 50 years and serves a wide span of logistics industries including maritime and intermodal terminals.

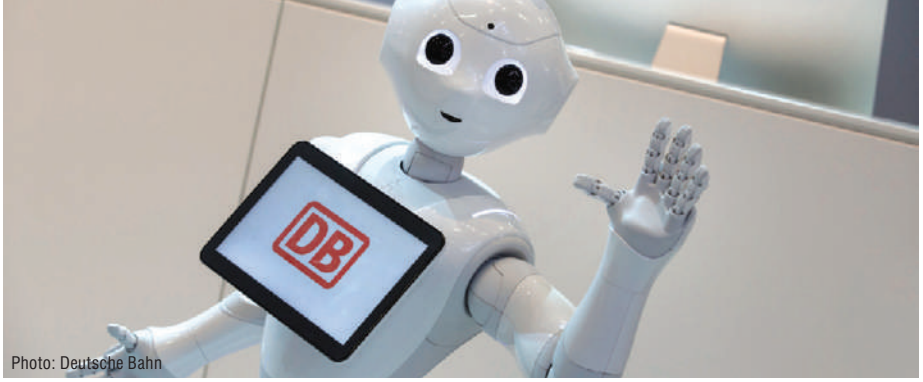


Photo: Deutsche Bahn

Reshaping logistics

by Matthew Wittemeier, *Marketing and Sales, Logistics Division, INFORM*

Drones, robots, and self-driving vehicles seem to have become a weekly discussion topic for the logistics industry. With major players like Amazon, Google, DPD, UPS, and even convenience stores committing serious resources to the development of these solutions, there is a consensus that technology will play a crucial role in shaping the future of the transportation business. If we accept this argument, then we, as an industry, must begin to consider the way that this will impact delivery organizations around the globe, so we can start to prepare our systems, processes, and people for what's to come.

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One can easily imagine a future not dissimilar to the current state whereby a parcel is carried between major central hubs by automated trucks before being shuffled to a local depot for dispatch by a driverless van equipped with a team of delivery robots who will facilitate the final leg to the door or parcel drop. While this is certainly a step forward, this is far too simplistic. The real benefit of autonomous technologies lies not in their ability to fit within the current distribution model, but rather to profoundly reshape it! For the sake of this article, these technologies will be divided into aerial (drones), land (robots), and automotive (self-driving or driverless vehicles).

Drones

There is much hype about drones providing a 10-30 minute aerial delivery service for lightweight consumables (generally up to 2.5kg). While this will allow companies to offer a "convenience" service in the future, it is not where they will deliver lasting value. Their real worth lies in their ability to offer pick-up and drop-off at ad-hoc locations. This will enable drones to provide new dynamic services never before possible.

Imagine, for instance, that you've forgotten your office keys at home. In today's world, this would mean that you would have to return to collect them. For many commuters, this means an hour or more of lost time. In the future, you'll use your smartphone to order and pay for a drone to pick up the keys from your home and deliver them to you as you arrive to work. The entire service will be individualized and managed without any rigid logistics frameworks.

Robots

Robots already today come in all shapes and sizes. First, their future versions will offer a very broad range of delivery options to logistics companies. From fleets of small- and medium-sized robots delivering standard packages through to larger individual units capable of delivering heavy packages, the future will certainly include these sophisticated mixtures of soft- and hardware. Robots will not only assist their human counterparts, but alike drones, will also open the door to innovative services.

Second, robots will also aid citizens logistically, so to speak. The flexibility to operate 24/7 in order to provide incredibly speedy service will reshape how consumers approach common household scenarios. In the future, when your child comes down with a fever late at night, you won't be rugging them up, packing them into the car, and driving to the hospital. No, you will remotely consult with your general practitioner, who, if need be, will dispatch any required medicines or equipment via a robot from your preferred pharmacy. The entire process will likely take half an hour from start to finish – and anyone with children knows this is a dramatic improvement from today's status quo. Robots will not only open new delivery options to end users; they'll

empower a greater shift towards remote services.

Self-driving vehicles

Autonomous cars and trucks have been making headlines for decades; however, it is their recent history that is the most promising. In 2015, Daimler received a license to operate its autonomous truck in Nevada, US. Self-driving vehicles are already challenging the entrenched state of affairs and are making their way into the market.

In the future, self-driving technologies will move from trucks into vans and eventually to cars. As this happens, more and more vehicles will transition to unmanned operations. This adds to the ability of logistics operators to run beyond the standard working hours. Autonomous vehicles will further extend the effective ranges of other technologies from their primary depots, which on their own is often limited. Logistics operators will gain greater flexibility to continuously respond to market conditions, e.g., with mini "pop-up depots".

Once-in-a-lifetime

In short, each of these technologies allows us to imagine, at least in some respects, a better tomorrow powered by innovation and outside the box thinking. On their own, each technology has the ability to reshape the way consumers interact with logistics operators. Collectively, they present a once-in-a-lifetime opportunity for operators to create truly innovative services that will reshape the consumer-commerce market relationship. When we look at how they could come together to redefine logistics as a whole, things get even more exciting!

End-to-end automation

The technology required to automate logistics exists. Depending on which side of the Fourth Industrial Revolution you're standing on, this is either exciting or just the opposite – it's the first sound of war drums proceeding doomsday. That said, while it's more than likely that certain groups of interest will push back on the idea of autonomous technologies taking over traditionally manned roles – it will nevertheless happen, just as steam engines and the light bulb did.

Automation has already been underway at ports around the globe. Its adoption is spreading rapidly to other industries as well. The legalization of the technology will only continue as it improves. For example, the U.S. Government took a positive position on self-driving vehicles in late 2016, describing a future where autonomous vehicles will save time, money, and lives. To add fuel to the fire, the US entered 2018 with a continuing shortage of 100,000 qualified drivers; a shortage that shows no sign of resolution, also in Europe. Self-driving vehicles are well positioned to fill this shortage, or, likewise, make the trucker profession more attractive by, paradoxically, taking the strenuous driving hours, especially at night, out of the equation.

From there, automation will continue as newer robotic technologies continue to evolve, benefitting from increased real world testing, advances made in Artificial Intelligence (AI) and machine learning (ML), and positive end customer feedback. This last point is crucially important. For instance, robots delivering parcels are an unprecedented change in how consumers interact with parcel delivery. Remember, consumers can either accelerate or break the neck of technology adoption, so almost every parcel operator is looking more intently for consumer feedback data to improve future services. This is true for both parcel logistics and across the broader supply chain.

Dynamic networks

As logistic operators services become more autonomous, so too will the broader logistics network that supports it. The future networks will be more dynamic and nimble than today's. Supply

Photos: Volvo

and demand ebbs and flows. What's new here, is that autonomous technologies can be redeployed more easily than their traditional manned counterpart. This flexibility will provide operators with newfound abilities to transform their nowadays static networks into a dynamic, data-driven environment of the future.

Last-mile delivery optimization is already evolving to cater for increasing data that allows for optimized routes. As an extension, if we apply the system logic already available to manage portable assets to autonomous technologies, operators will not only have a system that can react to operational changes, but grow so as to predict them and proactively balance resource requirements in advance. This agile approach is already proven to decrease required asset pools while increasing service levels. Applied to autonomous technologies, it would have a significant impact on managing capital expenditure and improving customer service levels in a dynamic network.

Systems

Technology in general is an enabler of innovative ways of doing business. The systems of logistics operators will evolve in the future from a disparate network of interconnected facilities into a centralized ecosystem that isn't physically tied to any single facility. Core system processes will be managed from a central location with remote presence at each individual facility.

By centralizing and interconnecting the physical and technological systems, operators will open the door to streamlined and higher quality decision-making, as well as improved efficiency and increased flexibility. By taking as many factors as possible into consideration, planning and execution will improve. Decisions that adversely impact the broader ecosystem will be known in real-time and their effects can be planned for, and in many cases mitigated, leading to an overall improvement in system efficiency. Finally, the dynamic networks of the future will require "light local infrastructure" to enable resilience in the network model. A dynamic model only works if the effort to remain such is minimal.

Processes

The processes of the future will need to be more dynamic, too. This is a counterintuitive point, as drones, robots, and self-driving cars are currently prone to failure in unpredictable situations. However, as autonomous technologies continue to evolve, the range of processes that these technologies are exposed to will as well. In no uncertain terms, the technology will become smarter and better able to respond to unforeseen circumstances on its own through the use of AI and ML technologies.

Photo: DP DHL

It is at this point that I make my case for more dynamic processes for the future. AI is on track to reaching a point where it can make decisions on its own within the parameters of acceptable operation that lead to a positive outcome. The processes of the future will need to move from mostly rigid "if this, then that" models to ones focused on goals achieved through acceptable operational parameters.

People

Reading this article, it would be easy to believe that humans have no place in the future of logistics – but nothing could be further from the truth. The future will see a shift in the roles and responsibilities of humans, that's a given. After all, robots are only good at doing what they are programmed for. However, how humans approach traditional roles will need to change. Also, new kinds of jobs will be created. Instead of truck drivers and dispatchers, we're more likely to see technicians, analysts, and strategists. The society has the responsibility to facilitate this transition, which won't happen cost-free, so that vulnerable groups won't be left behind.

As drones, robots, and self-driving vehicles enable an ever-increasing customer specific experience, the way we view and measure success will evolve. Dispatchers will move from managing the mundane to orchestrating a strategy that targets achieving a new era of key performance indicators. This new indicator set will be increasingly customer centric, in a way that enhances individualized experiences and customer journeys.

It has already begun

In this article, we've looked at what drones, robots, and self-driving technologies can achieve, what their collective impact might be on the industry that is constantly changing, and how the business of transport and logistics might have to evolve to better enable these changes to happen. One could easily dismiss this as overly optimistic or futuristic. But the simple fact of the matter is: the journey has already begun.

Operators all over the world are embracing these technologies, relying on the promise of bringing about a future which, although digital, will also create a new, hopefully better, reality. It is worth remembering that with pretty much any technological innovation, the first movers and early adopters get the upper hand in defining the customer experiences of tomorrow against which all operators will be measured eventually. ■

Photos: Inmarsat

Set for lift off

by Ronald Spithout, *President, Inmarsat Maritime*

A new research report commissioned by Inmarsat, a British satellite telecom, suggests that the maritime industry may be more advanced in strategies to adopt the analytic, management, and operational tools available via the Internet of Things (IoT) than many have supposed. Findings suggest that regulatory factors are playing a central role in maritime uptake, with the need to monitor emissions a key driver, but that a distinct group of owners are seeing IoT-based solutions as the gateway to a more efficient maritime industry.

Published in June 2018 as part of the new Inmarsat Research Programme 2018, the *Industrial IoT: land and sea* paper is based on 750 interviews done by researchers at Vanson Bourne exploring the use of IoT-based solutions in the supply chain, among respondents in maritime, transport and logistics, energy, mining, and agriculture.

The new report offers unique insights into prevailing commitments and attitudes towards IoT solutions in the supply chain, with its maritime part allowing 125 respondents (92 from shipping and 33 fishing) to speak for themselves. Respondents came from companies owning a mix of vessel numbers across a full range of types. Owners from Greece made up the largest constituent (25), followed by Japan (20) and Germany (15); container carriers represented the largest commercial ship type, with vessels otherwise split among tankers, bulkers, and offshore.

To view the research microsite and download the full report please scan the QR code or go to

Being probably the most detailed account of attitudes towards the IoT ever undertaken in the maritime sector, the report aligns with Inmarsat's strategy to power the maritime data revolution, via both the high speed Ka-band available on Fleet Xpress and expanded data use on the more established L-band channels. According to Inmarsat's expertise, IoT-based solutions can improve business intelligence, vessel/fleet performance, and crew welfare. As part of Fleet Xpress, the company is supporting a growing portfolio of content-rich management tools through its Certified Application Partners (CAPs) programme.

Cost-fixated laggards?

One of the most striking findings is that maritime respondents expect average expenditure per business on IoT-based solutions will amount to $2.5m over the next three years. While this is less than the figure established for the logistics sector, it nevertheless puts maritime significantly ahead of average spend projected by respondents among clients in the energy, agriculture, and mining sectors. Maritime respondents also say that they intend to invest a larger share of their IT budgets (7.8%) in IoT-based solutions than in any other next generation technology.

Drilling down into the report, owners show themselves as upholding the maritime industry's decade-long fixation with costs. While 51% of respondents say that revenue generation does not figure in considerations, 75% say that they have already realised or expect to see savings using the IoT. Route optimisation is typical and is identified by 57% as in use or on trial.

However, maritime respondents also exhibit a marked ambivalence towards IoT-based solutions that is unique to the sector: enthusiasm in some quarters is tempered, in that the industry is also home to the largest group of IoT "laggards", a description applied to over 25% of respondents. While 33% of maritime respondents believe that IoT solutions will bring 10-20% savings within five years, 14% believe that – even then – there will be no savings at all.

But direct operational savings are not the only savings available from deploying IoT-based solutions in the maritime sector, according to respondents. Cutting marine insurance premiums is cited by 70% of those interviewed as one of the most important drivers for adoption. The finding is especially interesting, given that the industry self-selects as a "laggard" when it comes to taking steps to remedy its cybersecurity shortcomings.

Regulation is providing a strong prompt for adoption. In line with the global fuel 0.5% sulphur limit that will enter force as of 2020, the target set by the International Maritime Organization to halve ship CO_2 pollution by 2050, and the EU Monitoring, Reporting and Verification for fuel use, 65% of respondents say they already use IoT-based solutions to

monitor their bunker consumption. A further 9% say they will do so within a year, with deployment projected as reaching 100% by 2023.

Making up one's (peace of) mind

When it comes to their cyber vulnerabilities, respondents are more concerned about data storage methods (55%), network security (50%), and potential mishandling of data (44%) than they are about targeted attacks (39%). At the same time, though, only 37% report initiatives to improve security training, with just 25% working on new IoT security policies.

This is all the more puzzling because there are solutions already available in the market that can help companies become more cyber-bulletproof. There is, for instance, the Unified Threat Management and monitoring service solution developed by Inmarsat under the Fleet Secure brand and unveiled at the end of 2017. As well as detecting external attacks, Fleet Secure protects vessel networks from infected USB sticks and crew devices connected to the onboard LAN, combats viruses, and blocks access to unsafe websites. It also isolates an infected area of the network so that threats can be contained. Support can either be offered through self-checking, via an online portal, or through different levels of monitoring, analysis, and reporting, all depending on the customer requirements that can include immediate notifications and an escalation to telephone support.

The industry's lack of cyber preparedness raises a deeper malaise over more full-blooded commitment to IoT-based solutions in some quarters. Overall, the industry's lack of decision-making skills is the most frequently cited impediment to uptake (by 56% of respondents). Maritime also identifies itself as behind the curve when it comes to planning skills, where 42% of respondents believe their organisations would benefit from additional cyber-competence against a figure for all respondents expected to amount to 37%.

Full deployment
– in-house or outsourced?

A different frustration appears to be thwarting ambitions among those already fully engaged in IoT-based solutions. Here, 51% of the maritime audience cited the time lag between data collection and its availability as an obstacle blocking their optimisation of IoT-based solutions: this was 11% ahead of any other explanation. This is despite the finding that only 20% of maritime respondents cite connectivity issues as a barrier to adoption of IoT-based solutions within their organisation – lower than any other sector.

However, to assess the maritime industry's readiness to adopt IoT-based solutions on owner testimony alone is to overlook the fact that much of the technical expertise historically held in-house has been outsourced to ship managers and equipment suppliers. Marine equipment can contribute 70% of the value of a new ship, meaning that it has been suppliers – rather than owners – making the running on connectivity, big data analytics, and app-triggered remote diagnostics and preventive maintenance. Some 64% of maritime respondents said that they would use an external partner to facilitate either "some" or "as much as possible" of their efforts to develop IoT-based solutions.

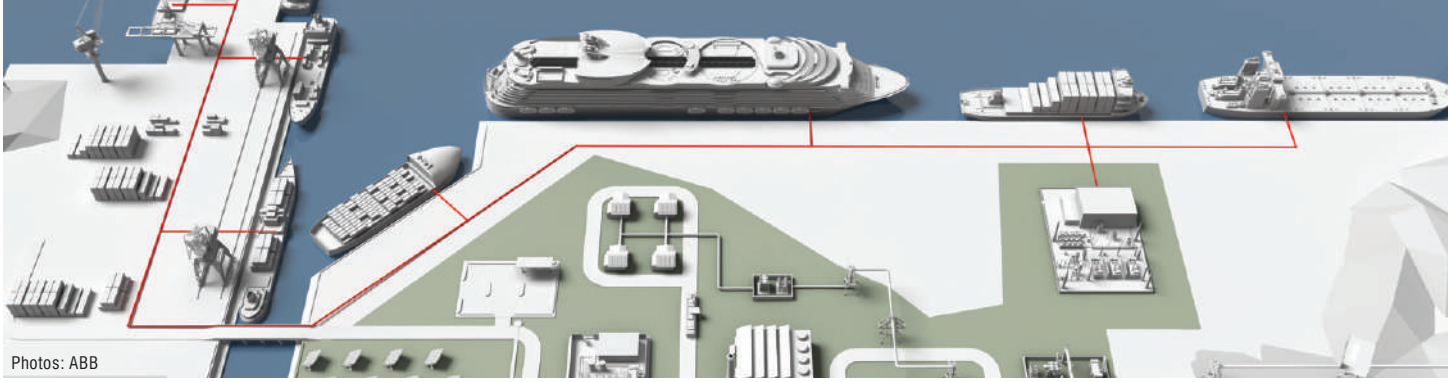
Nevertheless, in one of the most thought-provoking aspects of the report, early analysis also places maritime ahead of energy, agriculture, and mining when it comes to attitudes towards IoT-based solutions, with 34% of maritime respondents equating their position as one of "full deployment". This compares to a share of 21% among all 750 respondents and just 2% in the mining sector.

Driving the maritime "leaders" is the need for ships to be more cost efficient, cleaner, and safer than ever before, with 56% of maritime respondents already using or trialling smart asset monitoring. For the moment, fishing lags marginally behind commercial shipping, but the disparity may be short-lived: 57% of the 33 fishing organisations polled envisage uptake over the next 24 months.

The Inmarsat report debunks the well-entrenched mantra that the maritime industry is too far behind in the rear-guard to really embrace the digital revolution. It has its set of challenges, that's true, but there are both internal and external factors pushing sea shipping in the arms of the Internet of Things as well as other next-gen devices and software. ■

inmarsat

Inmarsat was set up in 1979 by the International Maritime Organization to enable ships to stay in constant touch with shore or to call for help in an emergency, no matter how far out to sea. Today, the company's fleet of 13 satellites serves not only the needs of merchant shipping, but also governments, humanitarian aid agencies, airlines, the broadcast media, and the oil & gas, mining, and construction industries. For more info please click www.inmarsat.com



Photos: ABB

Green and smart

by Roberto Bernacchi
Shore-to-ship power & Smart Ports Global Product Manager, Power Grids – Grid & Power Quality Solutions, ABB SpA

Speeding up decarbonisation in the transportation sector is crucial to reach the challenging global warming targets set in the Paris Agreement. Electrification of shipping, passenger and freight traffic alike, will be instrumental in achieving that ambitious goal. At the same time, shutting down fossil fuel-run auxiliary engines during ship port calls in exchange for drawing energy from the electricity grid will improve air quality in urban settings.

When it comes to the shipping sector, the first zero-emission vessels serving short sea routes are already a fact of life. Because high capacity, heavy-duty batteries can be now easily charged during even fairly short stopovers, many shipowners are implementing battery driven hybrid technologies to enhance the energy efficiency of their fleets, hence decrease the environmental footprint. Ports are doing the same on land. While air quality was "only" ranked as the 6th most important environmental priority in the 2004 edition of the European Sea Ports Organisation's *Environmental Report*, it topped the ports' agenda in 2013 and over the 2016-2018 period (similarly, noise was the main concern in 2009, it ranked 4th in 2013 and 3rd in 2016-2018).

As a natural consequence, the road to zero-emission terminals is now paved. Integrating traditional consumers (like cranes running on electricity, lighting systems, and buildings) with newcomers (such as e-mobility solutions including electric trucks, vehicles, and vessels) into the port electrical grid is clearly the way to go. In addition, both can tap into the clean energy revolution thanks to which more and more electricity is produced from renewable sources of energy. It's a win-win-win situation (Figs. 1-2).

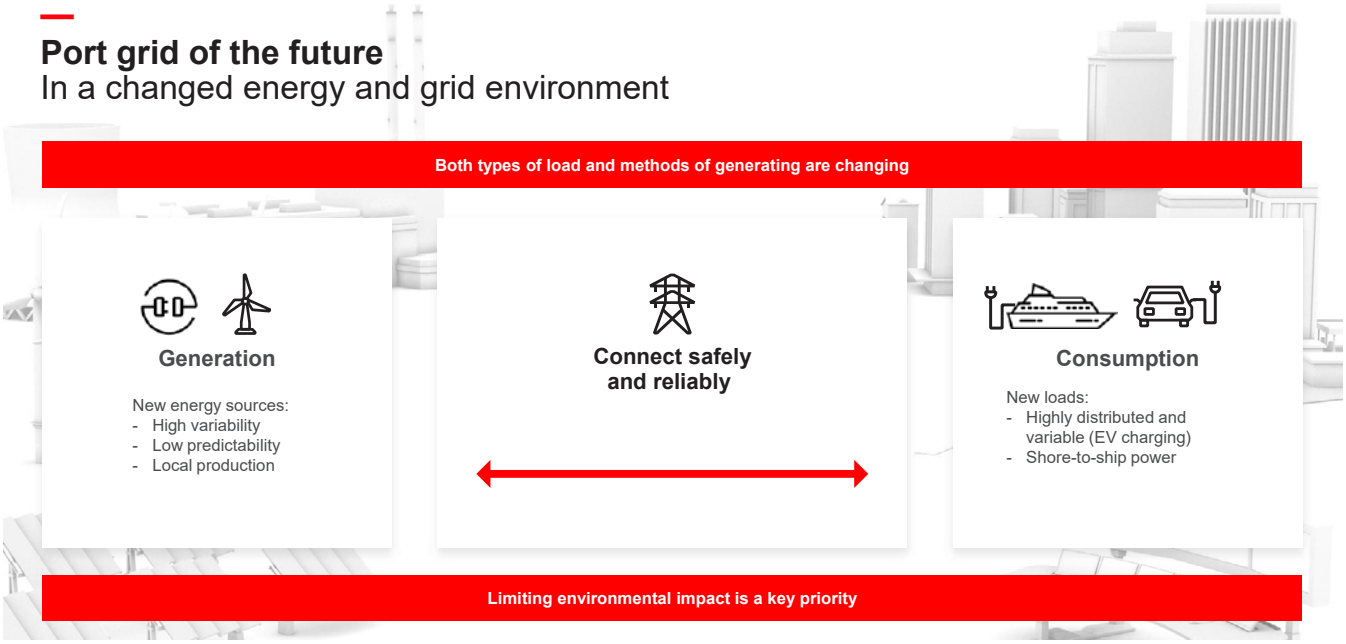
Smart means tailored

Looking at the new solutions that can substantially reduce greenhouse gas emissions (GHG), as well as noise and vibrations in port areas, shore-to-ship power (S2SP) plays a fundamental role. As a matter of fact, such systems allow vessels to plug into the onshore power supply and shut down their auxiliary engines while berthed (Fig. 3).

As such, ship's power load is seamlessly transferred to the shore-side power supply without disruption to on-board services.

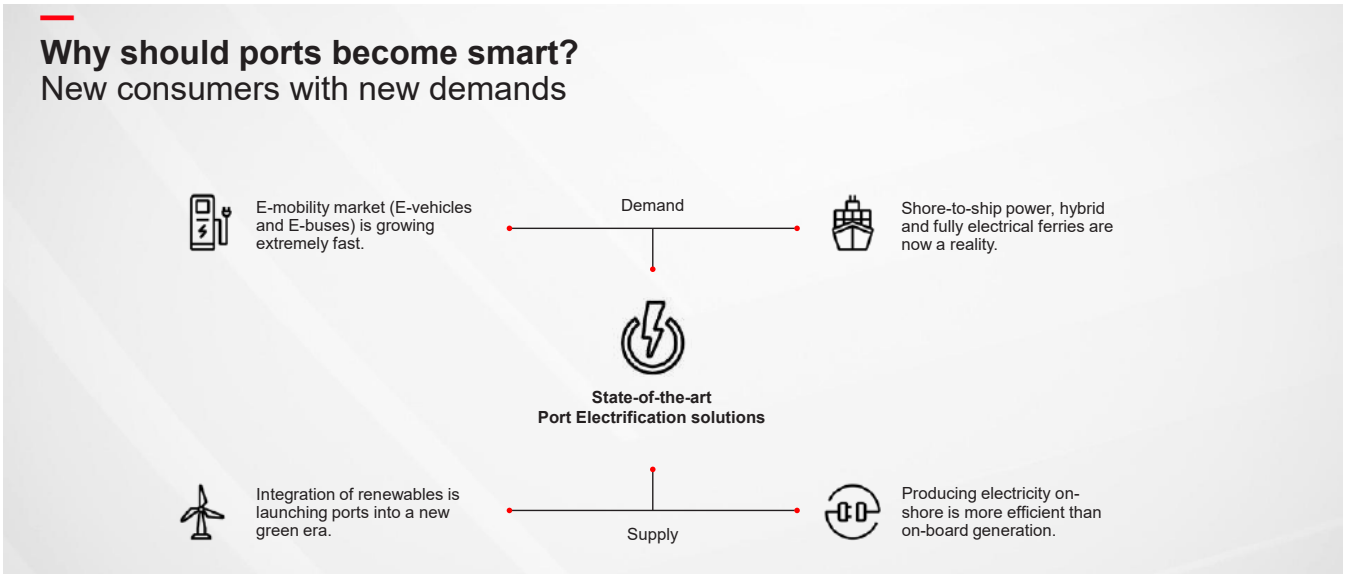
At berth, a large cruise ship can consume up to 20 Mega Volt-Amperes (MVA) whereas a super-post Panamax cargo can require as much as 7.5 MVA. Usually such a large amount of power is supplied by diesel engines which aren't exactly known for their environmental friendliness. Moreover, dockside emissions and noise are increasingly subject to regulatory scrutiny – especially as ports are often located in sensitive marine environments or next to large, densely populated cities (Fig. 4).

Fig. 1. Port grid of the future



Source for all figs.: ABB

Fig. 2. Future ports – sustainable transportation hubs



However, supplying so much power puts a strain on the port electrical infrastructure not only in terms of energy demand but also capital outlay, equipment complexity, running costs, and maintenance. Additionally, vessels can have a 50 Hz or 60 Hz on-board grid (the majority use the latter frequency), so there is an additional need for high tech equipment, a static frequency converter, for instance, that must not only handle high power levels but also adapt the local grid frequency to that of each vessel.

A few things need to be taken into consideration when carrying out a proper integration of shore-to-ship power facilities into the overall port grid. First, an adequate amount of power must be available to ensure that critical vessel loads are supplied throughout the entire port stay; this is achieved by a thorough assessment on the impacts of the shore connection system on the local grid and subsequent implementation of state-of-the art substation solutions to upgrade and strengthen the port electrical network. Second, a proper balance between electricity demand and supply in the entire port grid must be achieved, through the use of smart grid automation techniques, to enable smooth and reliable operations on a 24/7 basis. Third, the shore-to-ship power facility must be of fail-safe design, so that low/high voltage vessel connections can be operated by port and ship personnel in a risk-free manner, for the safety of both people and equipment. Lastly, a dedicated and robust electro-mechanical interface must be designed to handle specific vessel requirements, including a

Fig. 3. Shore-to-ship power – how it works

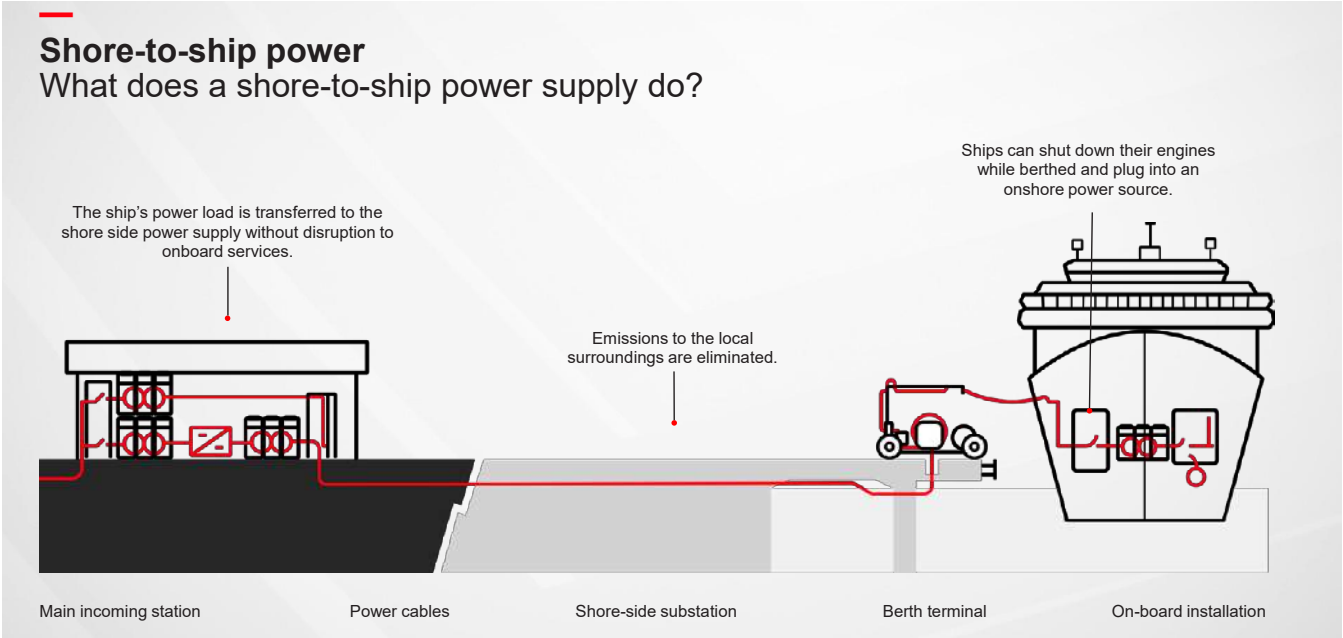
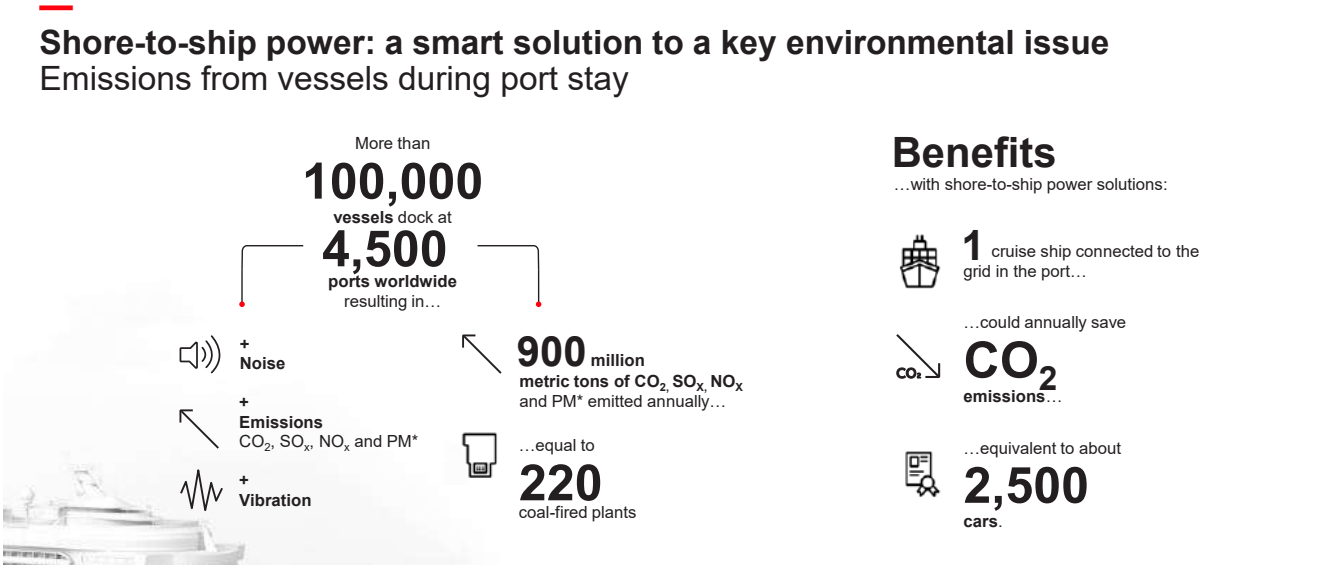


Fig. 4. Emissions from vessels during a port stay



turnkey package of specifically designed cable management systems.

That said, sustainability isn't only about supplying ships with green electricity. Optimising capital expenditure is also a smart thing to do. Here the investor needs to investigate, already in the preliminary project planning phase, what will be the best choice – installing single berth connections or maybe opting for a centralised, yet multipoint arrangement that will serve several vessels at the same time. Spatial limitations need to be factored in, so as to minimise the installation footprint, hence leave as much as space available for port operations.

The traditional S2SP solution can be easily compared with a home-based e-vehicle charging facility (Fig. 5). After berthing (parking), vessel (car) is connected to the electrical grid by a means of a static frequency converter with a dedicated and fixed plug.

On the other end, as ports and terminals face a constant growth both in terms of traffic and vessel dimensions, centralised solutions are becoming more popular (Fig. 6). In this case, an S2SP system rests in a remote location, usually near to the incoming power line from the local electricity provider, and power is distributed between the different berths to the various vessels. In addition, by enabling multiple vessel connections, S2SP technology can also be used to charge several hybrid and/or all-electric ships, something which represents an emerging segment in the shipping market (e.g., hybrid vessels can expect to save 10-40% of fuel).

In a nutshell, there is a clear trend towards zero-emission ports and terminals, but this innovative approach requires a clear shift to allow the creation of smart port grids, which should be seen as

Fig. 5. Traditional shore-to-ship power solution – single vessel connection

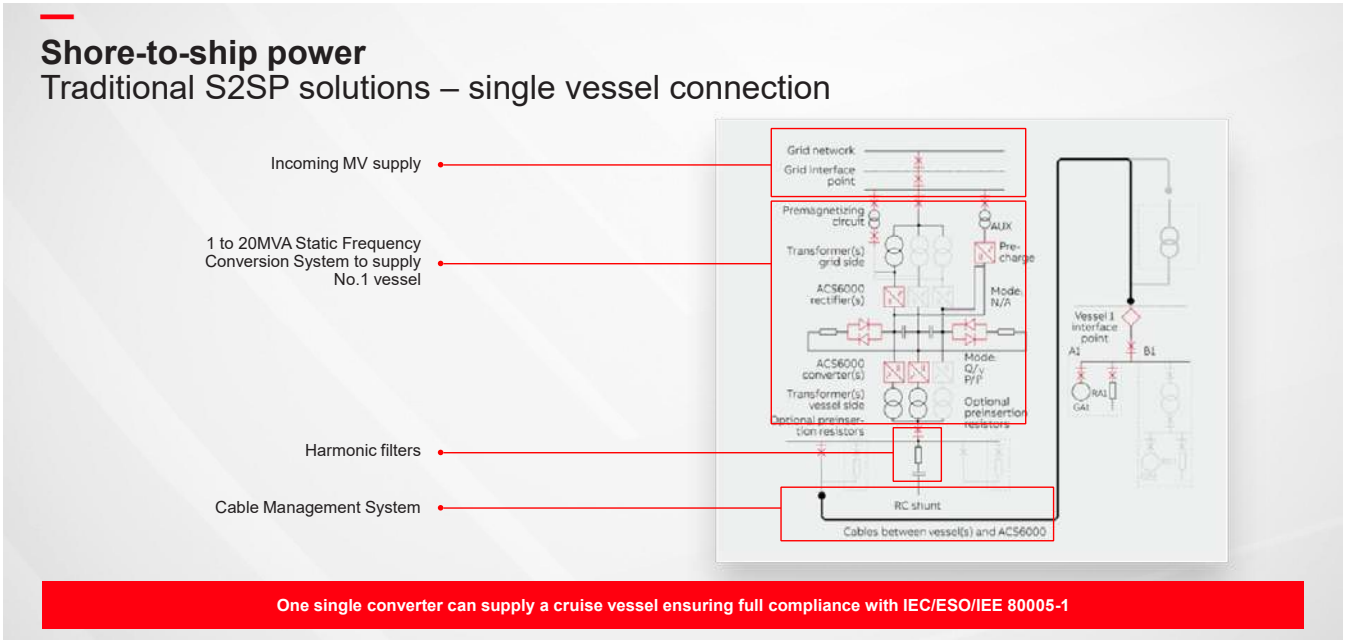
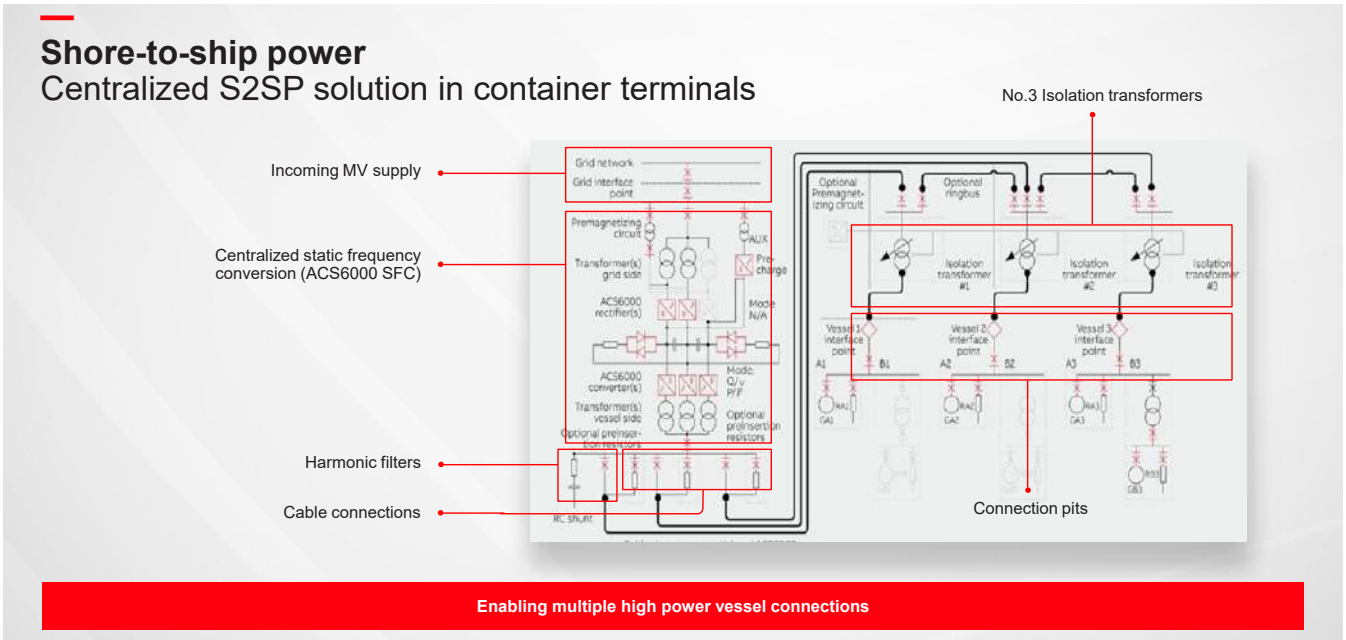


Fig. 6. Centralised ship-to-shore power solution



dynamic environments into which new electricity consumers or producers can enter at any time. For this reason, a smart port grid is a critical ingredient: to maintain a successful balance between demand and supply, the port grid must be robust all the way from the incoming high voltage substation down to the low-voltage user.

The only way

As a conclusion, S2SP and port electrification help harbours transition from their traditional role as vital regional economic engines and transit hubs for people and goods, to modern and sustainable entities fully integrated with the surrounding community.

One clear way to achieve that is through the provision of clean energy as well as by eliminating diesel emissions and reducing noise. Doing so will improve the work, transit, and living environment in and around ports. Electrification is the only cost-effective way to reduce on-site emissions by almost 100% locally and ensure long-term port growth. ■

ABB is a pioneer in shore-to-ship power solutions and smart ports, providing fully integrated systems and a broad range of services. In 2000, ABB delivered the world's first shore-to-ship power system to the Swedish Port of Gothenburg. Today, ABB offers a single interface for complete port electrification and grid integration, in line with global specifications and standards. For more info please visit www.new.abb.com

Photo: Pexels

Off the blocks

by Gabrielė Vilemo Gotkovič, and Nurlan Agayev, *Legal Counsellor, Alterlaw*

In spite of the overheatedly debated topic of cryptocurrencies, where, it seems, the main focus was put on the sharply rising or falling prices of Bitcoin and the likes, the underlying technology – blockchain – continues to attract attention, now also across the transport & logistics domain. Luckily, one doesn't need to be a nerdy tech geek to understand this, at first glance confusing, innovation. The purpose of blockchain is to allow digital information to be distributed – but not copied or freely modified. This way data integrity is preserved. In other words, all parties involved in the chain share the same view.

The blocks themselves are immutable, so once data is added to the chain, there is no possibility of changing it (unless such an option was built in from the very beginning). Blockchain allows information to be verified and exchanged without relying on a third-party authority, as opposed to, for instance, banks which act as the middleman between people and money. Isn't this what businesses have been looking for, greater transparency, security, and the chance to cut out the intermediary?

Whose block is this block?

One of the most beneficial applications of blockchain in the transport industry would be smart contracts (also known as self-executing, blockchain, or digital contracts), which could be used between shippers and carriers. In such a contract, the terms & conditions are recorded on the blockchain, and once all necessary provisions are met, a smart contract is automatically created. Next, transactions are easily recorded and validated on the blockchain, hence the moment the agreed requirements are satisfied, payments are immediately concluded. Smart contracts can automate agreements without the need for an intermediary (lawyers, notaries, etc.).

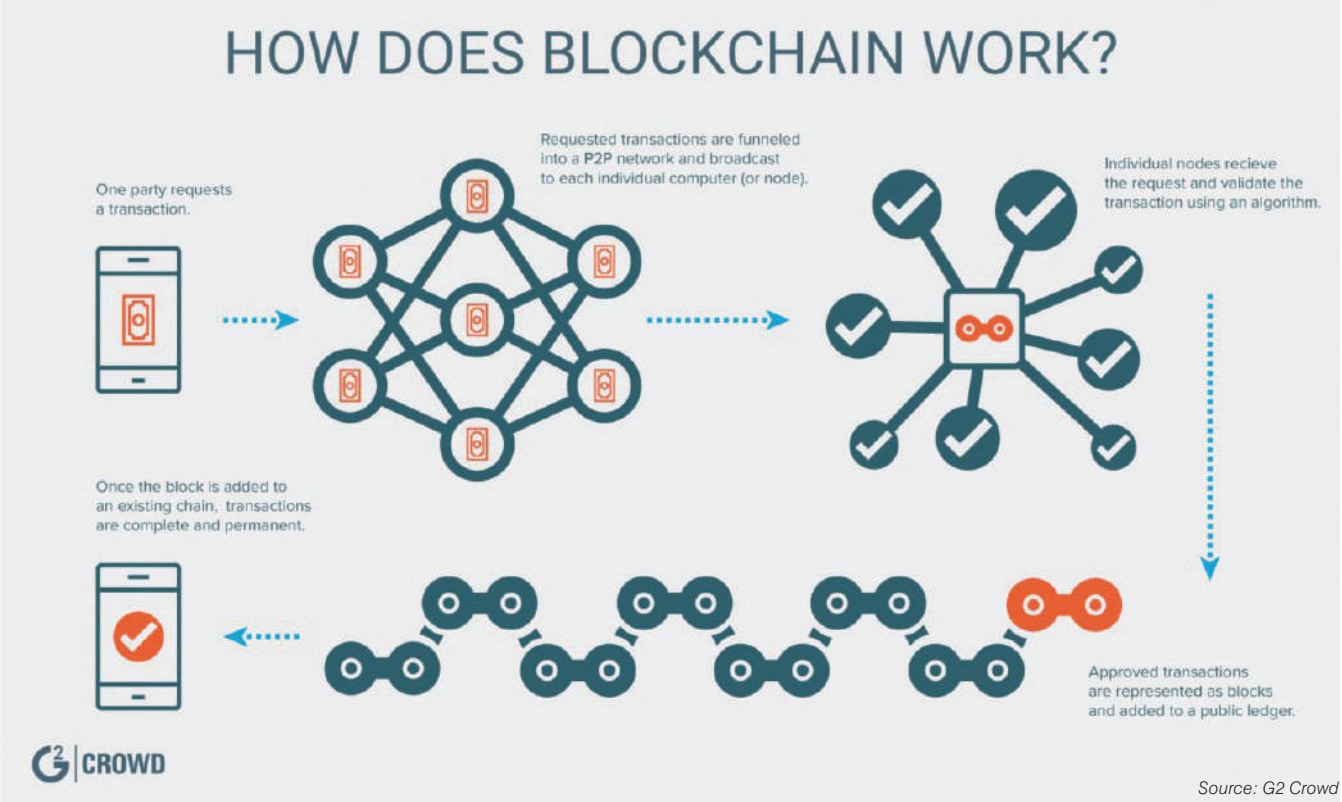
However, the use of smart contracts in transport & logistics can create legal issues, given the international scope of the industry as well as the stateless, so to speak, nature of the blockchain technology. Ownership-related contract law principles differ from country to country, thus identifying applicable law and respective jurisdiction may turn out to be more than challenging if a legal blockchain-created issue arises. Unfortunately, in the regulatory vs. tech race, the former tends to be slow in setting the framework, leaving disputes unresolvable for the time being (or subjected to arbitrary decisions). Contractual relations could potentially fall under the jurisdiction of the state where every single node of a network was created. Given the absence of international regulations under which scope blockchain would fall, the case for finding the applicable law would get extremely complicated once actors from different countries start to get involved in a blockchain, something all too likely to happen if we consider the logistics supply chains of today's globalised world.

Another legal issue stems from the fact that the recorded information cannot be altered, meaning that it is exposed to whoever it is distributed to. If it involves personal data, then privacy can be breached. A blockchain can be designed in such a way that it explicitly protects personal data. The design can include limitations put on who can join the network or by implementing a system of consent.

Blockchain is basically a decentralised system, which, on the one hand, makes it cheaper and faster for the business world to put it to use, but that, on the other hand, leaves it outside the power of authorities, legal or otherwise.

Pros and cons of greater visibility and connectivity

Blockchain can also increase the visibility across the supply chain by making it easier to track shipments or manage a fleet. Greater transparency not only discourages theft but also increases customers' level of trust and satisfaction. Instead of having to rely on third parties and their sometimes unverifiable statements to determine whether goods have been delivered on-time and in the right state, parties can validate the transfer on the blockchain which is visible to the parties it was intended to be visible for.



Source: G2 Crowd

Perhaps decreasing uncertainty could bring about other positive outcomes, like cheaper insurance.

Yet, despite the popularity blockchain has gained in recent years, it can only reach its full potential if everyone involved in the supply chain uses the same technology. In other words, blockchain has to be considered as the only valid source of true information. But what about cybersecurity? To what extent blockchain is actually exposed to hacking? In principle, the fact that a blockchain is in itself unchangeable ensures protection from direct hacking. However, if something is connected to it, the information blockchain holds is much more vulnerable. For instance, if a company decides to tag the goods it will transport for monitoring purposes, say luxury items or highly valuable medical equipment, attackers might hinder the technology's immutability by attacking the connected technology.

Target: costs

It is often said that the transport folk is conservative, either because they want to see other industries making sound business cases before rushing to the latest tech developments or, honestly speaking, they fear what they don't understand and stick to what has worked for them in the past. Money needed to make the investment leap is, of course, a factor as well.

That's maybe why one sees in the news the big names trialling the use of blockchain. For example, Maersk Line is using IBM's version of the blockchain technology to track perishable goods (according to the container shipping giant, administrative expenses account for around one-fifth of the total costs, and blockchain can help in axing them). Another example is Walmart, the biggest brick-and-mortar retail corporation in the US, which enthusiastically welcomed the blockchain technology and is using it as a tracking tool in order to ensure they can prevent any new salmonella scandals. Other breakthrough applications of blockchain will involve autonomous driving through ensuring safe vehicle-to-vehicle communication.

A report by Morgan Stanley states that blockchain technology can potentially be used to manage up to $500b of freight costs. While this figure may be merely an educated guess since we still lack the full picture of how and where blockchain can be used, it at the same time gives food for thought on how technology can and eventually will re-shape the business of moving people and things from one place to another. Interestingly, blockchain can serve as an example of technology that places people in the forefront, puzzling as it might first sound. Vitalik Buterin, Co-Founder Ethereum and *Bitcoin Magazine* said, "Whereas most technologies tend to automate workers on the periphery doing menial tasks, blockchains automate away the center. Instead of putting the taxi driver out of a job, blockchain puts Uber out of a job and lets the taxi drivers work with the customer directly." ■

ALTERLAW

Based in the Netherlands, Alterlaw is a start-up specialized in maritime- and transport-related legal issues, offering services in the field of incident and risk management, transport claims (cargo as well as equipment damage), and debt collection. People behind Alterlaw have years of experience in dealing with logistics affairs and can therefore approach their clients, mainly Europe-based short- and deep-sea carriers, trucking companies, and freight forwarders, with hands-on know-how.

Photo: Pexels

Well-informed shipping

by Stephen MacFarlane, *CIO, V.Group*

There's a lot of talk these days about how digitalisation can lend the shipping industry a helping hand in becoming more efficient in various ways – decreasing bunker consumption, better organising of port calls, automating the paperwork, etc. Investing in the latest digital technologies can also provide a tangible return on ship management services. But, while the growth in maritime digitalisation is improving access to valuable data and the ability to analyse it, it's insightful fact-based decision-making which delivers the true end benefit. This goes for all areas of vessel and fleet operations, including health, safety, and environment.

Shipping is a cyclical industry, driven by market conditions, safe working practices, and in recent years also the impact it has on the environment (and vice versa). For our clients as well as other equity organisations, it's the market that ultimately dictates whether a fleet generates money. To maximise investment, vessels must be run effectively and efficiently under, ideally, either an improving or declining market. At the same time, achieving and maintaining compliance with tightening safety and environmental regulations must be factored in, too, an incredibly challenging task itself. Add to the mixture the fact that the market is also more competitive than it's ever been before, making it time-consuming and complex to source and then retain competent crew.

Embarking a partner on-board

In a dynamic and challenging market, shipowners have a choice to make. Do they try to face these challenges within their own operations or do they seek partners to act on their behalf, thereby allowing them to focus on the market itself? V.Group's partnership approach enables the latter. We take responsibility for operations, from ensuring vessels are safe and efficient, through managing regulatory compliance, procurement, maintenance, recruiting crew, and accounts and budgeting.

Some shipowners may believe that they will lose control when on-boarding a partner to help in management. While an experienced ship manager or marine services company will always ensure that clients are informed of all aspects of their work, a more joined-up, real-time approach is needed to ensure owners have full transparency and, indeed, control. Thanks to the ongoing wave of digitalisation which made it possible to create ShipSure 2.0, what we believe to be a unique marine digital platform, we have been able to do just that.

Developed in-house using V.Group's 30+ years' experience as a global ship manager and marine services supplier, ShipSure 2.0 provides data-driven insight, informing its client decision making processes in real-time and helping to strengthen all aspects of business and fleet performance, be they operational, technical, or financial. Through the provision of automated and/or manual input data, ShipSure 2.0 offers a potent, secure, and easy-to-use digital platform that provides control and transparency – in the office on desktops through a web portal but also on iOS or Android mobile devices.

Managing risk – digitally

ShipSure 2.0's holistic approach provides a clear view of practical sensor-derived data from vessels, real-time information on V.Group's activity for each specific client, and a detailed financial component. An important aspect of this is a full health, safety, and environment application suite, which provides all the data needed to manage risk, while also ensuring that lessons are learned and followed up to evaluate and minimise foreseeable risk to the vessel, the cargo, and the crew.

Specifically, the suite includes six features. First, there's the Vessel Inspections & Audit Management module that tracks and reports on all inspections, vetting, and port state controls (incl. visit duration, findings, defects, and observations with tracking through to closure). It ensures that all required inspections are performed on-time, providing a record of all in- and external inspections conducted on-board and, equally important, the actions, follow-ups, and lesson learned from the findings. Risk managers can also analyse inspection through types, such as those with outstanding deficiencies only,

specific inspectors, or companies. With fully integrated links to the ShipSure 2.0 defect manager, planned maintenance system, procurement modules, job based dashboards, and reports, the software can help identify patterns and trends.

Second is Risk Assessment and/or Job Safety Analysis (the former can be used as a standalone module or fully integrated with the latter, which manages job specific and simultaneous operation risk assessments, incl. safety cards and operational manuals). Designed around a graphical risk matrix with a more intuitive user interface, it ensures that all potential risks can be considered, and it supports review and toolbox processes. The workflow functionality manages approvals on-board and via the office and permits to work, e.g. hot-work, while a checklist (toolbox) feature is linked with crewing and records the acknowledgement of the Job Safety Analysis by staff undertaking the job.

Next, Management of Change (MOC) ensures that change is a planned and managed process. It enables assessment on the impact of change, therefore helping to reduce the likelihood of unsuccessful or unsafe change. The MOC module provides ship and shore organisation with a workflow application to manage this process and provides auditability and approvals, and it is fully integrated with the ship's safety management system.

Fourth is Hazardous Occurrence (HazOcc) Management (which was not so long ago redesigned around guidelines derived from industry standards provided by the Oil Companies International Marine Forum, the Health and Safety Authority, the United States Department of Labor's Occupational Safety and Health Administration, and the International Marine Contractors Association). The HazOcc is integrated into the vessels systems hierarchy for reporting with improved root cause analysis functions and incorporates workflow management from ship-to-shore and inter office. Significantly, it provides the ability to report safe acts to support a positive safety culture. It also includes links to the ship's safety management system.

Fifth is Environmental Manager. This module provides an accurate record of waste discharged from the vessel at sea and whilst in a port, which, in turn, can monitor compliance and set targets for improvements in line with its environmental policy. It also has the functionality to record inadequate port facilities and advanced notification to port facilities, in addition to the ability to collate data from fuel consumption and bunker type to provide analysis of CO_2 emissions for the vessel at port and at sea.

Photos: V.Group

Lastly, the Work & Rest feature ensures compliance with the requirements on hours of work and rest as laid down by the International Maritime Organization and the International Shipping Federation. The system makes it easy to plan and track seafarer work patterns, actual working and rest hours, with a daily and across a period of time as required logbook. A dashboard provides an overview of overtime and non-compliance (the latter provides actions to quickly identify areas that need extra focus).

Informed and in control

The ShipSure 2.0 modules are designed for V.Group clients and fleet teams to stay informed and in control, ultimately resulting in improved performance under regulations. With the addition of the ShipSure 2.0 mobile interface, users can now enjoy 24/7 access to data, helping them to make decisions that ensure compliance and improved operational safety, even when they are away from the office. ■

V.Group

The London-based V.Group is an independent provider of global marine support services. With over 34 years' experience in managing vessels in the shipping, cruise, energy, and defence sectors, as well as having access to an international network of over 44k seafarers, covering all areas of ship management and crewing, the company is committed to delivering safe and compliant operations. V.Group is also an active member of the Maritime Anti-Corruption Network. For more info please visit www.vgrouplimited.com

IT and containers: a fitting or pinching match?

by Lars Fischer, *Managing Director, Softship Data Processing Ltd, Singapore*

The shipping industry has traditionally been a slow adopter of new technologies. Thankfully, this does appear to be changing. As a provider of software solutions for the shipping industry, at Softship we have welcomed the positive trend toward digitalisation across every aspect of the industry – from remote on-board monitoring systems through to big-data analytics for supply chain management. However, in this rush to update and digitise, many shipping companies are adopting solutions or IT technologies that simply do not suit their business needs. They are shoehorning digital applications into the conduct of their operations for the sake of "going digital." But if the shoe doesn't fit, why wear it?

Where once Softship would find container lines reluctant to adopt new IT technologies or systems, today we mostly encounter liner shipping companies that have adopted a smorgasbord of technologies, systems, and applications applied across their operations. The intention, of course, is good. These tools have been developed to provide the user with an easier way of working. But the vast majority of these applications have not been designed with shipping in mind. These "solutions" do not deliver the efficiency gains or cost savings that are possible by switching to a unified, integrated, and purposeful software system that provides full control over the administration of container shipping operations.

Schedule automation: invoices, bills of lading, cargo tracking, ETAs

One way of boosting reliability is by introducing high levels of visibility and automation into a container ship operation. Taking invoicing as an example, a good company-wide software solution will link relevant areas together to ensure that all freight and associated charges are considered at the time the invoice is raised. This will include the shipment and cargo types as well as specific client agreements, exchange rate values, and other factors. Any subsequent change to the shipment will be automatically checked against the current invoice and, if required, a supplementary payment document will be triggered. This level of automation and information consolidation has been seen to improve accuracy by as much as 100% for some container liners.

Receiving a timely bill of lading is crucial for the shipper, but it also represents an administrative headache for the carrier. An intelligent software package will collect information from the initial booking engine and merge it with information gleaned from the shipping instructions. Most modern shippers will send their instructions either by electronic data interchange (EDI) or through a web portal. As such, it is important that the carrier's internal systems can automatically extract the required data. Using built-in logic, the carrier's system will automatically apply the relevant clauses based on the type of shipment, commodity, or port. This comprehensive level of automation is now reducing the time it takes to raise an accurate bill of lading by up to 80%, something which not only frees up resources but also significantly enhances customer service.

Next, carriers of all sizes find it a challenge to keep track of where their boxes are located. The trick here is to install a system whereby container facilities across the globe can rapidly and accurately report container movements to the operator. The aforementioned EDI is central to this. But in the event that EDI is not available, the carrier's internal processes must extract the relevant movement information from the available manifests. These systems have been seen to reduce by half the time taken to report available container

stocks accurately. Moving forward, container forecasting, combining bookings, current container stocks, and trade patterns are also being used to increase container stock visibility and repositioning plans.

But it is not just the administration that is currently vexing shippers. On-time performance is, of course, of equal importance, and efficient scheduling is the first step to creating a reliable service. Modern software packages will take relevant company data and marry it with distance tables and other information to create a long-term and workable estimated time of arrival for the entire fleet. Before a schedule is released, the software will run and compare a series of options to identify the optimum programme. Once agreed, a robust and realistic schedule, together with any changes, can be quickly communicated to all agents and outstations to ensure all parties are working with the most up-to-date information.

As each voyage progresses, intelligent software should be able to accept data directly from vessel reports as well as arrival and departure messages. This information will automatically update each individual vessel's schedule and highlight any deviations from the plan caused by bad weather, port congestion, or any other factor. As soon as a problem is identified, and consequently a delay, the same software can take existing voyage schedules out of the operational environment and allow the operational team to simulate a range of measures to rapidly determine which action will either put the vessel back on track or minimise the impact of the delay.

An early indication of a potential problem gives the vessel operator sufficient time to inform those likely to be impacted by a schedule deviation and take the action necessary to minimise the impact. Reliability issues are hitting all areas of a container ship operation which, in turn, are having a negative impact on related supply chain activities. Although freight rates are low and profit margins are squeezed, a relatively small investment in internal systems and processes can make significant improvements in a number of areas where shippers say they are most concerned. Modern software packages are inexpensive but can deliver the company-wide visibility required to implement some much-needed improvement.

Software cost savings on hardware container maintenance and repair cycles

To ensure box availability and the associated required levels of customer service, operators have to review their equipment availability carefully and, in many cases, increase the number of containers they own or lease. This may be quite expensive. Against the backdrop of a squeeze in freight rates and pressure on operators to maximise earnings from every aspect of their business, it is important that costs are kept to a minimum without compromising customer service.

In general, between 5% and 7% of container stock is undergoing maintenance or repair at any one time. To ensure that the boxes move through the repair shop and are available as quickly as possible, the entire repair cycle can be managed with modern software applications. By connecting all relevant parties to a central web-based platform, such applications allow for seamless sharing of information, which results in a speeding up of the entire process.

Reports, surveys, repair estimates, and invoicing are made transparent and immediately available to all involved. With full visibility, the operator can closely monitor and control this complex process and push forward the repair. Experience shows that these control applications can axe in half the numbers of containers tied up in the repair and maintenance process. With a cost to the operator of around $2.0 per box per day incurred while a container is out of service, this represents significant savings. It also allows more containers to be available to customers, thus maximising revenue for the vessel operator.

Similar savings can be made in related areas. Many carriers choose to both own and lease containers and, with large numbers of boxes in circulation, it is easy to make invoicing mistakes; it is estimated that operators are routinely overcharged by up to 5%. However, by implementing software to track each individual leased container and to match lease invoices with actual tariffs, carriers can automatically detect and resolve any billing errors. Automation becomes vital for such large quantities of data and is even more important to handle the added complexity of operators subleasing to other lines.

Container handling charges must also be controlled. The issue is one of scale – large operators have many boxes distributed across a number of terminals and depots, with handling costs varying by container type and location. Keeping track of all these movements and their associated charges is a significant undertaking. It is believed that up to 5% of incorrect billing is due to administrative errors. This can be resolved by using software applications that track container-handling activity and crosscheck the resultant charges with previously agreed tariffs. Reconciliations are made and errors highlighted; facts can also be used to settle any subsequent disputes.

If the shoe doesn't fit, find one that does

Realising efficiency gains through automation is essential for any modern operator. Intelligent software applications will not only streamline core business processes but will also eliminate duplication, reduce errors, and save money on what has now become avoidable expenses, a point worth considering by any container operator in today's market. After all, if there is a perfect solution out there – one that really fits – surely shipping companies will feel the benefit? ■

The Hamburg-headquartered Softship, with offices also in Miami, Singapore, and Manila, is a provider of software solutions and related services to the international liner shipping sector. The company's portfolio includes LIMA, a modular, installed locally or hosted remotely software, specifically designed for carriers, that delivers efficiencies through simplifying business processes, eliminating duplication, and enhancing communication between individual business disciplines and a network of agents. Another solution, the also modular and local/remote ALFA, has been designed to suit the needs of liner agents. It streamlines business processes and eliminates inefficiencies while enhancing communication and data flow between company offices and its principals and customers. For more info please visit www.softship.com

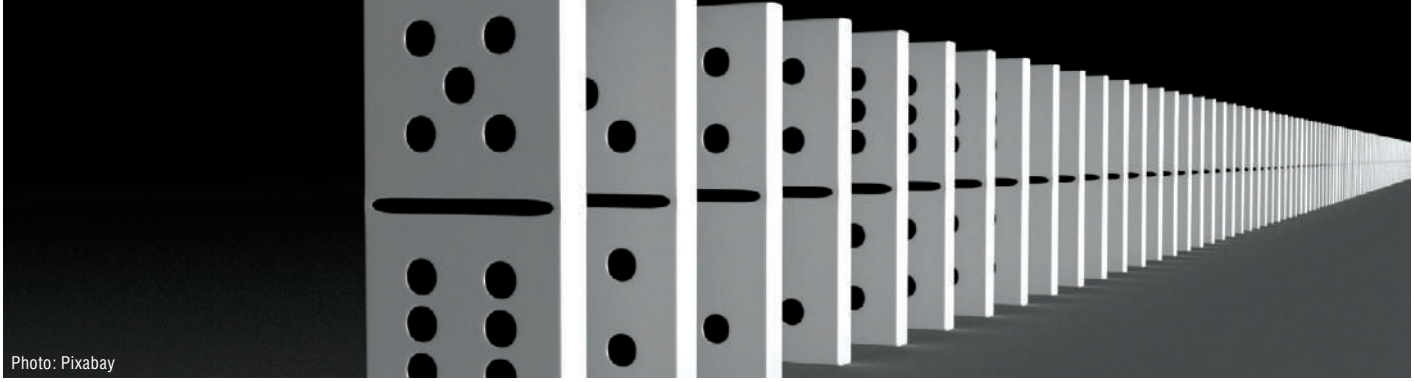


Photo: Pixabay

Interconnectivity: the key to maritime digitalization

by Lars Jensen, *CEO & Partner, SeaIntelligence Consulting*

Digitalization of the maritime industry has been topping the "hot topics" list for a few years now and the interest in who, what, and when will digitally disrupt seaborne trade has been only gaining traction. Hundreds – if not thousands – of both established companies and start-ups are developing soft- and/or hardware solutions for the industry, while many maritime companies are working on in-house developments, too.

Lars Jensen, a Ph.D. in complex mathematical analysis in physics, has 16 years of experience from inside the container shipping business, having worked, i.a., for Maersk Line and Youship, dealing with technological innovation and modelling in the oil & gas industry, too. Lars is CEO and Partner of SeaIntelligence Consulting, Founder of Vespucci Maritime Publishing, Co-Founder of LinerGrid and LinerGame, New York Shipping Exchange's Board Member, CEO and Founder of Cyber Keel, as well as the author of the book Culture Shock in Maersk Line and the most recent one, Liner Shipping 2025.

This inevitably leads to the questions raised during many shipping conferences and in private chats: what will be the winning technology?; who will be the Uber of maritime freight?; or how will blockchain disrupt shipping (because it will, right?)?

To add to the general apprehension about the future relationship between the maritime business and technology, let me just say, somewhat provocatively, that these inquiries are, at the same time, interesting and utterly irrelevant.

Scratch the surface a little more

Offhand, such questions are of course interesting – the entire industry is ripe for making a breakthrough with the use of digital tools. The emergence of hundreds of freight tech companies and billions of dollars in venture capital is clear proof of it.

But what are all those companies trying to achieve beneath the surface? They are all developing tools or solutions targeting specific pain points within the maritime supply chain. That's good because it also means much of the development is focused on actual real-world problems.

The really hard-nut-to-crack issue lies elsewhere and is most often noticed when the conversation moves on to discussing the so-called end-to-end solutions. You know, the "magical" digital end-to-end solution which will automate the entire shipping process (apart from the inevitable exceptions). But here precisely lies the key problem – what exactly does "end-to-end" mean? As lawyers would put it – it depends, specifically, on the perspective of the individual stakeholder.

Shipping is an industry with a large array of stakeholders involved – ship owners and operators, shippers, consignees, port authorities, terminal operators, customs authorities, health inspectors, equipment providers etc. They manage a specific task or process, a lot of them related to either a physical task, such as load- or unloading a container, or an administrative task, like customs clearance or health inspection, which are mandatory by law in most places. The end-to-end process would appear very different to each of the stakeholders.

By way of example, for a cargo owner, this would be from the receipt to the delivery of the cargo, with each of these places

Why companies should look to connecting multiple individual digital tools rather than search for an end-to-end solution


Photo: Pexels

actually being different depending on the International Commercial Terms in effect for the shipment. For a container shipping line, in turn, this would have to include the round trip planning of not only the vessel but also equipment (re)positioning.

Naturally, although they're sometimes very different from each other, stakeholders have overlapping processes. For instance, by having a customs clearance tool that matches the needs of both the authorities and the shipping line, cargo owners and ports benefit as well (the latter requires this process to feed their terminal operating system with data that's of use for other parties, but it doesn't work in the opposite direction, as customs has no use for such a system). This is of course just a very simple example to draw your attention to the bigger picture. Overall, we won't experience the emergence of an all-embracing end-to-end tool, simply because stakeholders have fundamentally different needs.

This, by extension, implies that the supply chain, so to speak, of new digital tools and services, will remain fragmented, as each solution will be tailored to take care of only a part of the process. In reality, though, this shouldn't surprise anyone. This is something we're all familiar with elsewhere. We all use a multitude of different digital tools in our daily lives. We do this partly because each tool is designed to help us with a specific task – and partly because this provides the flexibility to exchange one tool for another if a particular need changes, without us having to change everything we do fundamentally. A simple look at the technological development that's been taking place for the past couple of decades amply demonstrates that nothing is future-proof, and even the best thought-out solutions can quickly become obsolete.

Interoperability: the key to unlocking the power of flexibility

The real strength lies in not having a single end-all solution, but, instead, using a combination of different tools for different tasks. But, with the end-to-end master tool Holy Grail out of the way, one could nonetheless reasonably ask: given a plethora of digital tools and the ease with which companies can arrange their own tech landscape, are we sure these 21st century 'state-of-the-art', as they're often called, solutions will talk and work together in the end?

As such, in order to utilize this flexibility, one thing is more important than anything else in the development of maritime digital solutions, and that's interoperability. It's the ability of different systems, built by various vendors, to communicate automatically and easily.

An interoperable system awards all the benefits of flexibility. In contrast, one without this capability will only lead to a significant amount of resources being spent on manually making it do so – as no process in the supply chain is truly stand-alone, and therefore information exchange is absolutely pivotal. Furthermore, even though such workarounds can be devised, slowing down the flow of information, particularly automated one, can quickly cause problems, because when another system, for example with a client, has been suddenly upgraded, then the custom-built communication protocol is also likely to fail. Hence, when choosing to implement new digital tools into the maritime supply chain, functionality is of course key, but interoperability has to be seen as equally important.

What's more, at a layer that's deeper even than interoperability, we find standardization of data. Without this, interoperability is hard to achieve. It is urgently needed in the container shipping industry to see a set of standards for data not only be decided upon and emerge but actually being adopted as well. As long as this is lacking, it will act as a brake on digitalizing the industry. Now, that's an interesting puzzle to solve (and who knows, the solution might as well include blockchain)! ■


Photo: Pixabay

Communication is everything

by Ulf Siwe, *Communications Officer, Swedish Maritime Administration,*
and Cilli Sobiech, *Senior Researcher & Project Manager, RISE Research Institutes of Sweden*

Maritime systems lack integration. Better communication and data sharing could break that barrier, which would greatly contribute to the effectiveness of how ships interface both with each other as well as ports, not to mention all the hinterland actors whose businesses depend to a considerable degree on when a vessel actually calls to a berth. The solution lies in providing the numerous supply chain shareholders with a common maritime digital infrastructure, a platform on which everybody speaks the same language and has the same situation overview.

Such a solution would enable the parties, including system suppliers, service providers, and authorities to achieve interoperability by making it possible to easily exchange ships voyage plans, timestamps (e.g., estimated times of arrival to ports), navigational warnings, and any other standardized information that might come in handy.

Surprising as it may sound at first, this digital platform would give the maritime shareholders an identity. Just ask yourself a question in this context: would human-to-human communication on a global scale be even possible without unique telephone numbers or e-mail addresses?

Putting the backbone

Over the last ten years, several EU-backed projects have been developing a global common maritime digital infrastructure, EfficienSea2, STM Validation, ACCSEAS, and MONALISA to name a few. They've based their works around the Maritime Connectivity Platform (MCP) and its two critical components.

First, common identities are handled by the Maritime Identity Registry, think of it as an equivalent of a central person or business registry, which provides tokens for human interaction and certificates for machine-to-machine exchange. The Maritime Service Registry is the second key ingredient. It's like a sophisticated yellow pages phone book that includes all services and gives guidance on how to specify and register services as well as supports the discovery of services.

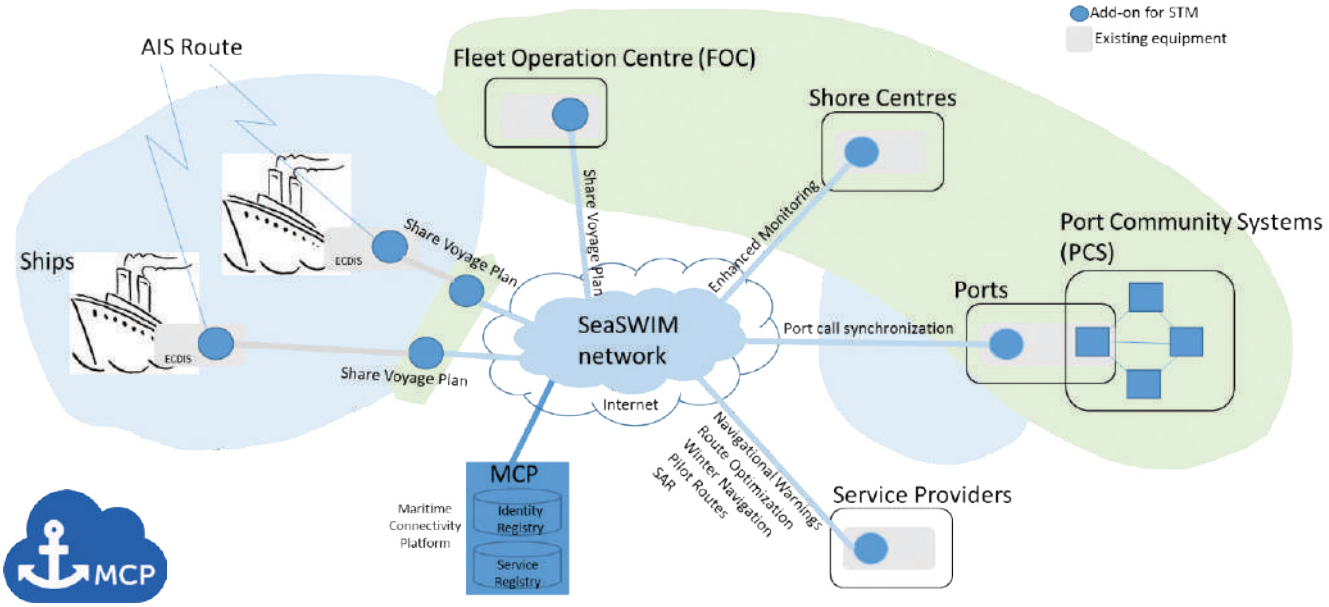
What's of no less importance, the MCP is an open source, vendor-neutral technology with which common Internet standards can make their way into the maritime navigation and transportation systems. In a nutshell, MCP functions as the backbone on which infrastructure for efficient, secure, reliable, and seamless electronic information exchange, using available communication systems, can rest.

In February 2019, the Maritime Connectivity Platform Consortium (MCC) was established by maritime administrations and research institutes from all over the world, among them OFFIS (Germany), KRISO (South Korea), RISE (Sweden), and the General Lighthouse Authorities of UK and Ireland (at the same time, the Danish Maritime Authority, the Swedish Maritime Administration, and South Korea's Ministry of Ocean and Fisheries have joined the MCC as Governmental Observers). The MCC is going to be a governing body, acting as the coordinator for the provision of guidelines and standards for MCP.

Automation + standardization = interoperability

In order to benefit from the infrastructure, we need automated processes and communication. To make automation work, however, we also need new standards both when data formats are concerned themselves as well as for data exchange.

Data standards for, first, voyage plans and, second, port timestamps, have been developed as part of the Sea Traffic Management (STM) concept. The former is a global standard since 2015, while international committees are putting the latter to the test. What's more, by looking into other existing and developing data standards, the people behind the STM can bring to the table interoperability as well as heightened security. One of the features is a standardized way for services (i.e. machines) to connect to the MCP, making sure that the connection is secure, and establishing the encrypted communication channel to the other end of the



service (i.e., another machine), through the SeaSWIM network.

STM also offers standardized application programming interfaces (APIs), meaning all actors who will exchange data using any of the STM-supported standards, will do it in the exact same manner, instead of building their own individual solutions which might encapsulate the data differently, hence compromise interoperability. This is of paramount importance, as it's the APIs that are the final piece of the puzzle to make the information exchange truly interoperable. The feasibility of this approach has been confirmed within the framework of the EU co-financed STM Validation Project. STM-APIs have proven to work on Electronic Chart Display and Information (ECDIS) and Vessel Traffic (VTS) systems and within the scope of actual operational services used by authorities and commercial actors.

Benefits in practice

To this date, STM Validation Project succeeded in creating a data-mining network of 250+ merchant vessels employed in regular traffic as well as six VTS centres, nine ports, and 13 simulation centres across the whole of Europe. They all rely on a common maritime digital infrastructure, backed by many of the dominating system suppliers for VTS and on-board systems, such as Wärtsilä and Transas, Furuno, Kongsberg Norcontrol, Airbus, SAAB, and Adveto.

As a result of the efforts, the STM Validation Project reports, VTS operators' ability to predict challenging traffic situations has increased because ships can share their voyage plans with the VTS centre via a common maritime digital infrastructure. Next, among seafarers, 73% of them feel safer when they use enhanced monitoring services from shore, based on the digitalised sharing of their voyage plans. A large majority of port actors such as agents, port control, and terminal operators also sees a potential for better decision-making with digitalised and standardized information sharing.

That said, during the works a few question marks have been uncovered, too, identifying new study fields. For instance, is there a risk of over-reliance on the digitalised information?; could operators onboard and onshore be exposed to information overload?; when will system suppliers have matured their user interfaces, so they support the use of multiple digitalised services in a smart way?; will international regulations need to be updated as STM continues to redefine the playing rules?; and in what way seafarer training will change?

Evolution never stops

Basing on these findings, a number of other digital-heavy implementation projects are working towards bringing more operational solutions to the market. The Baltic Sea region is leading the way, including the EfficientFlow, RealTimeFerries, and BaltSafe initiatives.

In regards to the first, the ports of Rauma and Gävle will implement STM solutions for improving the synchronization between ships arrivals and port operations as well as improving the ports' internal efficiency. Ferry and other traffic in the archipelagos between Finland and Sweden will use STM services to optimize the traffic flow near the many narrow passages.

The second project will see major ferry lines sharing with hinterland actors real-time estimated arrival and departure times. This will help logistics companies improve their planning and has the potential to make passengers more satisfied with their journey.

Last but not least, BaltSafe targets further increase the safety of tankers in the Baltic Sea, providing the carriers and crossing traffic with a common situational picture, with the possibility of advising on speed adjustment or course changes to avoid risky situations.

Apart from these, there are other projects across Europe and around the world that are picking up the STM and MCP standardization ball and running with it. In Singapore, for instance, the traffic control function will use the ships' real-time voyage plans for planning, whereas the Port of Rotterdam is already compatible with the STM data formats.

Standards, agreements, and common digital assets are now in place to support interoperability between independent commercial and public IT systems. But evolution never stops: emerging standards and technologies have to be constantly evaluated and considered for implementation in order for the STM solutions to stay relevant. ■

Photos: World Ports Sustainability Program

Leading by example

by Victor Shieh, *Communications Partner, the World Ports Sustainability Program*

Looking ahead into what the future holds for ports is, in many respects, a challenging task, given the rapid pace of evolution in our society. A complex mixture of geopolitical changes, commercial strategies, digitization, and automation, along with the push for a dramatic reduction in greenhouse gas (GHG) emissions and a swift energy transition will shape the future of the sector. To help ports prepare for that future, the International Association of Ports and Harbors (IAPH) established its World Ports Sustainability Program (WPSP) almost exactly one year ago, an initiative that has already borne fruit all around the globe.

The WPSP aims to demonstrate global leadership of ports in contributing to the 17 Sustainable Development Goals (SDGs) of the United Nations. Specifically, it aims to empower port community actors worldwide to engage with business, government, and societal stakeholders in creating sustainable added value to the local communities and broader regions, including the environment and other earthlings, in which their ports are embedded.

Since its inception, the WPSP has registered over 70 sustainability-related projects undertaken or implemented by IAPH member ports. These projects are frequently associated with more than one of the SDGs, and as such, they go well beyond mitigating the impact of climate change or providing for social projects in local communities. In fact, the WPSP covers the entire spectrum of port-related sustainability activities.

At the IAPH Guangzhou World Ports Conference, taking place this year between 6 and 10 May, the IAPH World Ports Sustainability Awards ceremony will recognise the best registered projects from the WPSP. The initiatives have been shortlisted into the five main activity categories by a jury panel comprising of senior figures from the industry, including the World Maritime University, the United Nations Conference on Trade and Development (UNCTAD), Institute of Chartered Shipbrokers, and the University of Antwerp Management School. In this article, we're highlighting numerous examples of WPSP projects that have been nominated for the Awards. These clearly demonstrate how ports are putting the UN SDGs into practice.

Resilient infrastructure

The port industry is currently undergoing a transformation. Through the adoption of disruptive technologies and innovations, the way cargo and passenger traffic is handled by ports and their operators has already considerably changed. But there's more to come. Digitisation will provide the impulse towards more resilient infrastructure in ports; it will bring efficiency improvements in terms of just-in-time vessel arrival and departure planning, time at berth, port capacity, loading & discharge productivity, and hinterland mobility and connectivity.

Innovative and cost-efficient use of digital applications to handle major infrastructural and service challenges in ports include the implementation of Port Single Window (PSW) systems. These smoothen the handling of both cargo and passengers by efficiently connecting up stakeholders such as port authorities, operators, customs, port agents, shipping lines, forwarders, and shippers. The Port of Abu Dhabi's PSW MAMAR, which currently connects five ports and 54 private jetties, is integrated with 20 shipping lines and covers 100+ shore-to-hinterland services. MAMAR is also integrated with three other PSWs and 11 ports in China, Belgium, and Spain.

A second example is the Port Links online portal developed by the Port of Barcelona, which allows exporters, importers, traders, and forwarders to calculate the optimum route for their cargo from the point of origin to the final destination, including all the Europe-wide intermodal options to and from the Catalan port. Simple data entry produces a map result with a graphic representation of the best route, and aggregate results for distance, CO_2 equivalent, emissions, variable costs, and transit times.

Scan the QR codes to find out more details on the port projects in respective categories of the 2019 edition of the IAPH World Ports Sustainability Awards

Resilient infrastructure	Port of Abu Dhabi: MAMAR	Port of Barcelona: Port Links	Port of Hamburg: MoNArch	**Climate and energy**	Ports of Stockholm
Port of Antwerp	Port of Amsterdam	**Safety and security**	Port of Antwerp: PIN	JadeWeserPort and Niedersachsen Ports: RapidReach	Port of Abu Dhabi
Community outreach and port-city dialogue	Civitas Portis	NEPTUNES	Ports of Los Angeles and Long Beach: CAAP	Port of Abu Dhabi	Port of Busan
Port of Kobe	**Governance and ethics**	Gladstone Ports Corporation	Kenya Ports Authority	Port of Vancouver	WPSP

The 5G Mobile Network Architecture (MoNArch) research project, carried out across the Port of Hamburg, is another fine example of how digital innovation can upgrade heavy-duty operations. With a transmitter located on top of the Heinrich-Hertz Television Tower, the project covers 8,000 hectares of port area testing ground. This network, which operates at extremely high speeds of 10 gigabits per second, will enable multiple new applications to improve vessel and traffic circulation, real-time environmental measurements, as well as other applications using virtual and augmented reality, thereby creating a safer and interconnected port environment.

In general, with such sci-fi technologies becoming more and more a fact of life we may reach the point where automation and real-time data handling between port players converge. Using big data via smart devices located throughout the port, the application of Artificial Intelligence (AI) and predictive forecasting will ultimately provide a new type of infrastructure where the line between software and hardware will become blurred.

Climate and energy

The International Maritime Organization's 2050 target for GHG reductions heralds the start of a structured approach towards capping harmful emissions that will ensure a very necessary adjustment to shipping's status as the world's 6th largest emitter (were it to be a country; read more in *Baltic Transport Journal* 6/18's *The rub of the green. Zero-emission shipping by 2035*). With UNCTAD's *Review of Maritime Transport* predicting compound annual growth of 3.2% for seaborne trade between now and 2022, the port industry must act.

There are many interesting examples of energy transition in IAPH member ports, many of which are striving towards carbon-neutrality in the long term to achieve global climate goals. Ports are more frequently using renewable energy sources like wind, solar, and tidal power. They are also setting up possibilities for vessels to be bunkered using alternatives to heavy fuel oil such as liquefied natural gas (LNG), methanol, or hydrogen.

As an early adopter, the Ports of Stockholm authority has taken significant strides toward its ambition to reduce its own total emissions by 50% between 2005 and 2025. It has done so by offering port fee reductions to ships with reduced nitrogen oxides emissions and above-standard GHG footprints, such as LNG-powered vessels, along with offering eco-friendly onshore power supply at several quays, changing truck fuel composition, installing LED lighting, as well as energy monitoring of vessels and buildings.

Meanwhile, the Port of Antwerp has successfully tested the prototype model of a three-bladed vertical axe water-turbine mounted in the existing infrastructure of a lock on its left bank which produced far more wattage using tidal waters than anticipated. The Belgian port is continuing to explore this avenue by using a further four turbines within the vicinity of its other main locks, employing for the task 3D design, virtual reality, and computed fluid dynamics.

There are a growing number of initiatives in the field of the circular

economy, whereby port authorities work together with their industrial clusters to generate their own energy and give new economic purpose to waste products. One example is wastewater being used to cool industrial installations, which can be deployed for urban heating purposes. Another example in this arena includes the construction of a plant in the Port of Amsterdam which transforms plastic to diesel. The goal is to process 35,000t of plastic – resulting in a reduction of approx. 57,270t of CO_2 emissions – as the fuel produced emits 80% less carbon dioxide compared to regular diesel.

Safety and security

Regulatory measures, standards, and industry procedures exist to ensure that safety and security of ship and cargo operations aren't compromised within ports. However, the environment in which enforcement of these applicable laws and regulations are applied have completely changed. The threat of global terrorism, cyber security breaches, piracy, illegal smuggling of humans and illicit materials have required ports to rethink their health, safety, security, environment, and quality strategies.

Ports have addressed these challenges with an ever-increased focus put on implementing various ISO and other health and safety-related norms. Technology is being used to innovate in the field of control and inspection, as well as to monitor activities in and around ports, such as the Port of Antwerp's Port Information Network (PIN) project. This has brought together companies located and working within the port area of 130 km² to jointly report on any suspicious activities. To make it more practicable, the system works with geographical clusters, so that companies can share and receive in real-time selected messages about relevant events in their immediate vicinity.

In a similar move to simplify information sharing, the German JadeWeserPort together with Niedersachsen Ports, the latter having 15 ports under its authority, introduced an online emergency notification system called RapidReach in 2016. It allows operators to react quickly in an emergency situation without using expensive hardware or special devices. Users can alert everyone using a cell phone or a simple PC with a web browser and Internet access. The system was installed throughout Lower Saxony, significantly reducing alert response times from hours to minutes.

The Port of Abu Dhabi has also taken the safe, secure, and sustainable values to heart. The port has implemented a smart health, safety, and environment policy that encompasses not only key performance indicator measurements but also internal initiatives such as an annual award scheme for employees, departments and partner suppliers, with certificates and prizes.

Community outreach and port-city dialogue

Port community actors can develop synergies to solve collective issues in- and outside the port area, including the elimination of hinterland bottlenecks, the improvement of port-city integration, as well as dealing with environmental and conservation issues, and transport-caused externalities like reducing pollution or providing greater mobility.

Civitas Portis is testing innovative and sustainable urban mobility solutions in several European port cities as well as one Chinese port. The participants serve as living labs and implement integrated mobility measures, such as introducing low-emission waterborne passenger services, building safe bike lane networks, and migrating public transport services from carbon fuels to electric power.

The Noise Exploration Program To Understand Noise Emitted by Seagoing Ships (NEPTUNES) is a two-year research project that has been undertaken by several ports around the world to establish benchmark measurements, propose a labelling standard, and to ultimately reward ship owners that take steps to mitigate noise emitted by their ships when entering, berthing at, or leaving the ports.

On the West Coast of the US two ports that usually compete with each other, Los Angeles and Long Beach, have teamed up to create and implement the San Pedro Bay Ports Clean Air Action Plan (CAAP). Since its adoption in 2006, diesel particulate emissions from mobile sources in and around both ports have decreased by 87%. The CAAP 2017 update involved over 70 local community stakeholder meetings and resulted in 14 strategic goals, assigning concrete projects to decrease port-equipment emissions to zero or investigate whether energy for port usage can be drawn from more environmentally-friendly sources.

Constructive dialogue with local communities and other stakeholders is a vital success ingredient in bringing ports closer to their neighbourhoods, be they urban, local, or rural. Several case studies in port cities around the world have demonstrated that such dialogue, combined with appropriate investments in infrastructure, can make a genuinely positive impact, whether they are destined for public use or regeneration of natural habitats.

The Abu Dhabi port's three-year-long plan to invest over $100m into four ports along the Al-Dhafrah coastline has generated opportunities for the local businesses, including fishing, whilst the construction of a cruise beach destination alongside the wildlife reserve at Sir Bani Yas Island has resulted in this part of the Emirates becoming a highly popular tourist destination. Several environmental studies were carried beforehand out, which showed that the water quality in the surrounding lagoons, home to mangroves and several species of migratory birds, would benefit from the beach as well.

The South Korean Port of Busan has embarked on an ambitious decade and a half-long unused waterfront space renovation project. It has started as a citizen-led advisory committee initiative, where the valueforbusan.com website has been used to brainstorm the best ways of using the space for the community. To this date, the project has resulted in the creation of a 7,400 m^2-big swimming pool complex, a campsite that spans over 8,900 m^2, and a free outdoor foot spa which provides low price access and free events to low-income families and has generated local employment for the youth and the elderly.

The Port of Kobe in Japan has five man-made islands, all of which have been the focus of various environmental and sustainable economic development projects to improve water and air quality, increase biodiversity, and lower noise reduction. Environmental initiatives include the creation of an artificial lagoon on the airport island and a beach for public use. Programmes encouraging the growth of algae and marine organisms in the bay have been initiated, too, establishing green zones in the urban zone on the Rokko island and growing tree populations along the seawalls. In addition, a 15m m^3 of capacity offshore reclamation disposal site has been created for dredging soil, industrial, and general waste. The port itself has introduced onshore power for visiting ships, converted rubber tyre gantry cranes so that they could use hybrid power and is currently installing LNG bunkering facilities, with additional plans for a hydrogen plant for future ships.

Governance and ethics

Principles of good corporate governance are increasingly being introduced by various port authorities. IAPH intends to take a leading role as to how ports integrate the 17 UN SDGs into their business principles. A recent UNCTAD-hosted workshop of IAPH member ports in Geneva has already established a reference baseline for a roadmap. The ultimate aim is to provide guidance through appropriate tools and methodologies and to boost the integration of SDGs in port governance and strategies.

For an example of applying business ethics in practice, the Gladstone Ports Corporation has worked closely with local first nation communities in establishing an Indigenous Land Use Agreement covering the activities across the ports of Gladstone, Bundaberg, and Rockhampton. This agreement on the use of land for port development generates benefits with supporting applications made by the local community to, i.a., fund education and training, and to support overall community welfare.

In Africa, the Kenya Ports Authority has allocated a percentage of its bottom line to its Tunashusika Corporate Social Investment Program, which aims to fund and support school infrastructure in the many surrounding coastal communities from which its present and future employees will come. The fund also works with local counties in the construction of healthcare facilities and hosting on-site medical camps.

A fine example of integrated governance can be found in Vancouver. The Vancouver Fraser Port Authority has engaged in a dialogue with other stakeholders to identify the long-term future vision of the port. It is now actively weaving in sustainability into the port's business processes. Proper measurement tools are being developed to make sure the initial ambitions can be truly realized. For instance, the port not only publishes comprehensive annual sustainability reports but has also set up a publicly available online dashboard that covers all aspects of the supply chain, including live monitoring data of the environment in and around the port.

The World Ports Sustainability Program warmly welcomes initiatives from ports all around the world to add their own sustainability projects to the initiative. Anybody can do so by presenting their project on the WPSP website www.sustainableworldports.org/submit-your-project. ■

IAPH

International Association of Ports and Harbors

founded in 1955, the International Association of Ports and Harbors (IAPH) is a non-profit-making global alliance of 170 ports and 140 port-related organizations covering 90 countries. Its member ports handle more than 60% of global maritime trade and around 80% of world container traffic. IAPH has consultative NGO status with several United Nations agencies. For more about the organisation, please visit www.iaphworldports.org

WPSP

World Ports Sustainability Program

In 2018, IAPH established the World Ports Sustainability Program (WPSP). Guided by the 17 UN Sustainable Development Goals, it aims to unite sustainability efforts of ports worldwide, encouraging international cooperation between all partners involved in the maritime supply chain. WPSP covers five main areas of collaboration: energy transition, resilient infrastructure, safety and security, community outreach, and governance. For more info, please check www.sustainableworldports.org

Photo: Pexels

The rub of the green

by Przemysław Myszka

The conversation around whether more vigorous steps are needed to be taken to axe the sea shipping's carbon footprint often start with the 3% figure – the industry's contribution to human-caused climate change. Now, this isn't a preposterous number, right? One of the sort at which eco-conscious people would cry with outrage instantly. Or is it? Taking a step back and looking at the bigger picture, Germany is responsible for about the same amount of greenhouse gas (GHG) emissions. Can you imagine the commotion stirred if somebody would have proposed to exclude the world's fourth biggest economy from a worldwide deal to curb the increasingly suffocating levels of pollution – in addition, it seems, for no good reason at all?

But that's exactly what happened just a couple of years ago when the global community found itself in the throes of a painful yet ultimately successful delivery of the Paris Agreement. However, sea shipping was left outside the deal.

Nevertheless, maybe this omission was a good thing in the end. The issue whether sea shipping is actually the most environmentally-friendly mode of transport has been gradually appearing in the general public's field of vision. Not so long ago, BBC Radio broadcasted on the topic, stacking against each other the numerous green technologies that are making their business case into the mainstream maritime industry (incl. air lubrication, rotor sails, and heat recovery) and what's the norm today, namely sailing on the toxic remains of what's left after cleaner and more valuable products have been squeezed out from crude oil.

Earlier, investigative reports were published, detailing how the International Maritime Organization (IMO) – taken captive by the irresistible charm of corporates whose interests deeply penetrated the agenda of this United Nations institution – is somewhat reluctant to convince its stakeholders that it's high time to take the responsibility for its share in inducing climate change. Under pressure, intriguingly, the IMO is now waving the green flag, setting GHG reduction targets and pushing forward the reduction of sulphur content in bunker from 3.5% to 0.5% globally. Green shipping is the new black across the Organization's corridors, so it appears. Does this sudden change of heart, irrespective of whether it's whole- or half-hearted, heralds the end of dirty shipping? Or is setting reduction targets a smoke screen targeted at jamming the green terrorists' cacophony, reality-detached hippies who don't know beans about shipping?

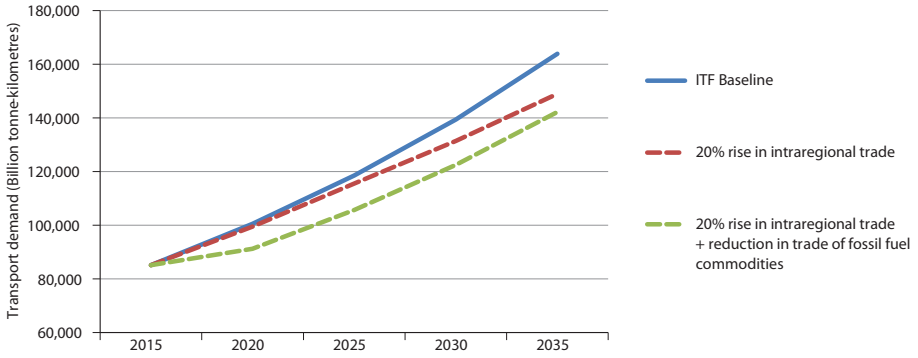
Putting aside these political divagations, let one question take the centre of the stage instead. Do we have the means to make sea shipping emission-free in the foreseeable future?

The starting point

The International Transport Forum (ITF) at the Organisation for Economic Co-operation and Development scrutinised thoroughly this exact issue in its case-specific policy analysis *Decarbonising Maritime Transport. Pathways to zero-carbon shipping by 2035*. What's interesting, the paper omits the issue of how much it'd cost the industry to make the transition – an otherwise more than a relevant topic to discuss and which surely has been the top concern of merchants since the first freighter set sail. Instead, the analysis concentrates entirely on different types of measures, as well as on various possible configurations between them, which, if implemented in a timely order, would lead sea shipping to rightly reclaim its title of the world's most environmentally-friendly mode of transport in just under two decades of time.

Using the ITF International Freight Model (which estimates freight flows of 19 commodities in all transport modes, using actual routes and real distances, converting trade in value into freight volumes in tonnes-kilometres, t-km), the paper's authors started off with calculating what will be the baseline level of emissions from international sea shipping in 2035 (choosing this year wasn't an arbitral pick; according to the ITF, "An alignment of international shipping to a 1.5°C scenario [the desirable

Fig. 1. Transport demand scenarios



Source for Figs. 1-2, 4-7, and Tabs. 1-2 and 4-5: International Transport Forum's Decarbonising Maritime Transport. Pathways to zero-carbon shipping by 2035

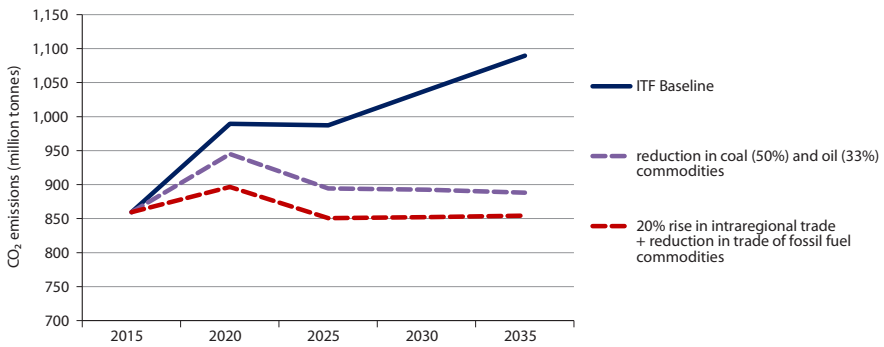
increase in Earth's temperature by 2100 as laid down in the Paris Agreement] would require decarbonisation of the sector between 2035 and 2050"). If shipping affairs were to continue to be handled as they are today – which includes the 0.5% sulphur cap and the tightening demands for newbuilds as specified in the future tiers of the Energy Efficiency Design Index (EEDI), but nothing more – then shipping will emit 23% more GHG in 2035 than it did in 2015, up from 850mt to 1,090mt. In this business as usual scenario, emissions will be driven upwards by growing trade, estimated to double by 2035.

However, *Decarbonising Maritime Transport* reads, two trends have the potential to limit this increase in shipping emissions quite substantially. First, a decrease in trade in fossil fuels. Second, regionalisation of trade. The former will be a direct result of the Paris Agreement. Signatories, in order to fulfil their Nationally Determined Contributions, will have to move away from fossil fuels, most notably in power generation. This will, consequently, result in buyers importing less and sellers sending out fewer shipments, e.g. of coal (in 2015, a 2.9% year-on-year decrease in worldwide coal production led to a 4.3% yoy decline, more or less 50mt, in seaborne coal trade). According to the ITF, by 2035 oil and coal trade will lose around 33% and 50% of volume, respectively.

The latter trend, in turn, will see more trading taking place regionally, first and foremost between the economies of Asia and Africa (intra-regional trade, measured in t-km, will grow in these areas by a factor of 4.5 and 6.0, respectively). A few tendencies will increase the likelihood of trade regionalisation becoming a fact of life, such as the rise in protectionism (if X doesn't want to trade with us, Y will find market outlets or source materials from elsewhere, preferably a place closer to it, hence slash some of the transportation costs of logistics on the side). In addition to this, the law of diminishing returns will continue to cut into the benefits provided by global supply chains, i.a., as labour costs will flatten out internationally. Next, game-changing technologies and new consumption models, like 3D printing and the circular economy, will topple traditional manufacturing and commerce down (read more in BTJ 3-4/17's *New consumerism. Emerging ethical economy as a response to modern day problems*). "As 3D printing is becoming affordable, faster and better compatible with a variety of materials including metal and ceramics, an increased use of this technology could potentially reduce trade in certain raw materials in manufacturing. […] PwC predicts that within the next 5 years, about 85% of companies in manufacturing will incorporate 3D printing into their business. […] A PwC study from 2015 projected that about 37% of ocean container shipments could be threatened by 3D printing," ITF writes in this regard. If Europe's economy turns the circular mode on, this alone will bring down the continent's consumption of raw materials by as much as 32% and 53% by 2030 and 2050, per McKinsey's estimates. Last but not least, there's the already mentioned 0.5% sulphur cap, which, according to various predictions, will cause a spike in the cost of container shipping anywhere between 20% and 85% due to higher prices of compliant bunker. In this regard, the ITF brought forward a study example in which it was shown that if ship fuel becomes 10% more expensive, it will cause the domestic iron ore production in China to rise as well, by approx. 14-18%, thus decreasing the need to (ship) source it from abroad.

Combined, these two trends will bring back shipping emissions in 2035 to the 2015 level of 850mt, a figure they used later in their study, assessing the mitigating power of individual measures and potential mixes of them. Authors of the *Decarbonising Maritime Transport* also mentioned other events that could change the shipping industry, including year-round ice-opening of the Northern Sea Route or a more pronounced modal shift from sea to rail thanks to the New Silk Road becoming more and more attractive in the eyes of shippers. But, they concluded, these can have a marginal GHG cutting effect at most, e.g., 90kt of CO_2 in the case of intercontinental rail transports, i.e., 0.009% of today's shipping emission.

Fig. 2. Combined impact of rise in intraregional and reduction in fossil fuel trade by 2035



Action please!

"[…] shipping GHG emissions might fall by 2035 due to less transport of fossil fuels and more regionalisation of trade, but this will only result in a moderate decrease," the ITF states in its analysis. As such, three

Tab. 1. Main technological measures[1]

	Potential fuel savings
Light materials	0-10%
Slender design	10-15%
Propulsion improvement devices	1-25%
Bulbous bow	2-7%
Air lubrication and hull coating	2-9%
Heat recovery	0-4%

[1] *Emission reduction potentials are assessed individually. Ranges roughly indicate possible fuel savings depending on varying conditions such as vessel size, segment, operational profile, route, etc., hence limiting the possibilities for comparison. Numbers cannot be cumulated without considering potential interactions between the measures*

Tab. 2. Main operational measures[1]

	CO_2 emission reduction potential
Speed	0-60%
Ship size	0-30%
Ship-port interface	1%
Onshore power supply	0-3%

[1] *Emission reduction potentials concern the entire ship fleet. Numbers cannot be cumulated without considering potential interactions between the measures*

types of measures will be of paramount importance in decarbonising the shipping industry: of technological as well as operational nature and those focused on providing clean fuels/sources of energy (Tabs. 1-4).

Technological means are directly linked to the EEDI, which in the view of the ITF is not demanding enough (even though the Index's requirements are incrementally tightened every five years by lowering of CO_2 emissions, gram per tonne-mile, by as much as 10%, 20%, and 30% in 2015-2020, 2020-2025, and 2025-2030). Already today certain ships perform better than the most challenging phase of the EEDI will require in six-to-eleven years' time. Moreover, it won't be until 2040 that all ships are covered by the Index, following a gradual tonnage renewal.

A somewhat stronger incentive than solely relying on the EEDI will be therefore required to encourage investors to opt for more energy efficient vessels. What do all ship operators like? Lower bunker bills, undeniably. But while reducing the weight of a ship by using lighter materials, decreasing hull-water friction thanks to air lubrication, better coating and/or installing a bulbous bow, along with producing energy on-board through heat recovery all promise to save a tonne of fuel in the tank here and there, the potential to fully take advantage of these measures is limited. Slender hulls, for instance, can be used only with newbuilds. The lighter high-tensile steel is also more expensive to buy, whereas ship welders aren't used to working with it – and no shipping line will risk a bad welding faced with making a multimillion order. Bulbous bows can actually increase friction and the ship's wetted surface. As for heat recovery, the more energy efficient the ship is, the less energy can be captured.

That said, though, a number of companies have already included these measures in their fuel shaving strategies. For instance, the Grimaldi Group, the world's biggest ro-ro line, and Finnlines, its northern Europe shipping arm, are gradually upgrading their fleets, both by investing in new eco-designs and by replacing older solutions with those more optimal. This approach may deliver slight, at first glance unimpressive performance gains only. But at the end of the day, these percentages add up and save the Group a lot of money which can be reinvested in even better ships in a few years' time. Grimaldi and Finnlines have a proven track record of doing exactly that.

Operational measures – such as regulating the speed at which ships sail, deploying bigger vessels, optimising port calls and smoothening terminal handlings, and plugging into onshore power supply (OPS) – are more promising, according to the ITF authors. "A rule of thumb used in the literature states that engine power output of a ship is a third power function of speed. This means that a speed reduction of 10% translates into engine power reduction of 27%. As it takes longer to sail a given distance at a lower speed, a 10% speed reduction results in a reduction of the energy required for a voyage by 19%," *Decarbonising Maritime Transport* cites a paper from 2012. The environmental benefits of slow steaming are therefore evident, not only in theory. It was thanks to this measure that sea shipping decreased its carbon footprint in the period that followed the financial crisis of 2008. Still, this eco-bonus was nothing more than a side effect of ocean carriers scrambling in a cold sweat to patch the widening gap between decreasing trade and growing tonnage capacity – though one can sometimes get the feeling that it's vocalised to give an impression that the industry was concerned with the environment when putting a break on how fast ships plough through the waves. Now, however eco-beneficial, the shipping industry is allergic to the notion that somebody would regulate at how many knots their vessels should operate. A solution that sits in-between is when a company orders a newbuild equipped from the start with the machinery that delivers the best possible speed-fuel ratio. Again, that would require enough time for the global fleet to renew its tonnage.

Next, making ships bigger, bigger, and bigger. The rationale behind this measure is simple – larger vessels emit less CO_2/t-km (granted, naturally, that their capacity is utilised to a similar or even greater extent). Generally speaking, an increase by 100% in ship capacity results in a 66% growth in required power. This has, however, its limitations, as the law of diminishing returns sets in. For instance, emissions per t-km go down by 33% when a shipowner exchanges a 26k dwt-big dry bulker for a 46k dwt one but only by 17% when upgrading from a 46k dwt to a 72k dwt. Also, "While deploying large ships tend to reduce energy consumption in the shipping leg, the total impact on overall door-to-door logistics performance may be negative unless such a move is complemented by smaller ships that can assist in the onward distribution of cargoes. […] Net energy efficiency may be superior for a small ship with access to more ports and cargo types, being able to fill its cargo hold to capacity," ITF authors underlined. Despite sustaining heavy losses over the past couple of years, a lot of shipping lines, especially container carriers, are more than trigger-happy to put more eggs into the bigger ships basket. But it seems that this has nothing to do with the environment, not even with balancing supply and demand in trade for that matter, but rather with ousting the competition by offering lower freight rates.

In what way ships interface with ports is a big issue, too (pun intended). We published numerous articles on this subject – from the *Lifting the game* series (BTJs 5/15, 1/16, and 3/16), reads on the Sea Traffic Management and EfficientFlow EU co-funded projects (1/16 and 1/18), or the award-winning piece Dumb, dark, and disconnected (5/17) – all of them concerned with the gross inefficiencies created by port calls, from big container ships eating up all the quay wall despite the fact that smaller ships would be served swifter, to vessels and ports not talking to each other in real-time. All of this is symbolised in the "hurry up and wait" attitude of ship operators, who, despite these cost-cutting times, can apparently swallow the hours their vessels spend on anchorage, with the extra fuel needed to run the auxiliary engines. For their part, terminal operators have to invest in new berths to accommodate this chaotic movement of ever larger ships. The ITF believes that order can be introduced by improving data exchange among all parties involved – ports, terminals, shipping lines, and port service providers, like pilotage and towing. Apart from the benefits brought about by arriving on-time, the quicker a ship is served in a port, the less it pollutes the neighbourhood with health-damaging compounds, including nitrogen and sulphur oxides (NO_x, SO_x), and particulate matter (PM).

Having mentioned seaports, in which ca. 5% of ship emissions is generated, the ITF advocates in favour of providing cold ironing as an additional GHG lowering tool. This way auxiliary engines can be turned off while the ship takes the energy from the electricity provided from the grid. That is, as long as the power generation mix is green itself. One study example, but not from the *Decarbonising Maritime Transport* analysis, took a ferry that plies between northern Sweden and Poland's northwest. When plugged to a Swedish grid (an option that's actually available in reality), the ship enjoyed a 50% reduction in its at berth emissions; on the flip side, drawing on electricity on the other side, generated through burning coal, increased the ferry's footprint by half. One way of solving this puzzle would be to deploy an OPS running on liquefied natural gas (LNG), just as HHLA Container Terminal Burchardkai has done in the Port of Hamburg. The grid can cause trouble in another way – by having insufficient capacity to cater to the needs of bigger ships, like cruisers which are in essence floating hotels coupled with amusement parks (read: they consume a tonne load of electricity), or several units berthing simultaneously. For those who nonetheless want to invest in a fixed OPS, it currently costs $5-10m to set up such a facility, plus ships have to be adapted to use it. Port authorities can encourage shipping lines to green their fleets this way by charging lower port fees. National agendas can give a helping hand in this regard, namely by tax-exempting OPS, which, however, is rare and can be found today in Denmark, Germany, and Sweden only. That said, it's likely that cold ironing will be exempted from taxation in the EU in the near future, a move pushed by the Transport Committee of the European Parliament. Last but not least in this thread, OPS can serve a different purpose, i.e., as charging stations for electric ships, which, in turn, leads us to the last set of measures in the ITF's toolbox: harnessing the power of alternative fuels and sources of energy.

Apart from slow steaming, it looks like running a ship on a non-fossil fuel has the biggest potential in emission reduction (Tab. 4), in certain cases eliminating GHG emissions entirely (if we exclude upstream emissions). Nevertheless, all proposed alternatives have their contras. For instance, while advanced biofuels (those that aren't made from edible products) are across the board compatible with current ship engines, pipelines, storage tanks, and bunkering infrastructure, and can be blended with other fuels, some types have a shorter "shelf life" due to oxidation and, according to *Decarbonising Maritime Transport*, only up to 15% of demand could be satisfied without the need to deforest new areas or cut into the food supply. Additionally, the 2nd (biomass) and 3rd (waste, algae) generations of biofuels are still under development. This, however, does not put oil majors off introducing biofuels to their portfolios, e.g. ExxonMobil plans to offer a bio-bunker in 2025 while Statoil is experimenting with seaweed. The Amsterdam-based GoodFuels is already today encouraging the industry to swap traditional bunkers for biofuels (read more in the article *One atmosphere. Enabling shippers to mitigate their carbon footprint with innovative bunker solutions* on pgs. 74-75).

LNG, although still a niche solution, has been penetrating the bunkering supply chain for a few years now. More and more vessels are gas-run, both when it comes to numbers and types (over 120 in operation, excl. gas carriers, plus the same number on order). In the Baltic, for example, LNG is used to propel ro-paxes (incl. local passenger-car and cruise ferries), container ships (both retrofit and newbuild), tankers (oil/

Tab. 3. Emission factors of different fuel types (tonne CO_2/tonne fuel)[1]

Diesel/gas oil	3.206
Light fuel oil	3.151
Heavy fuel oil	3.114
Liquefied natural gas	2.750
Methanol	1.375
Biodiesel	0.522[2]
Hydrogen	0.0[2]
Ammonia	0.0[2]

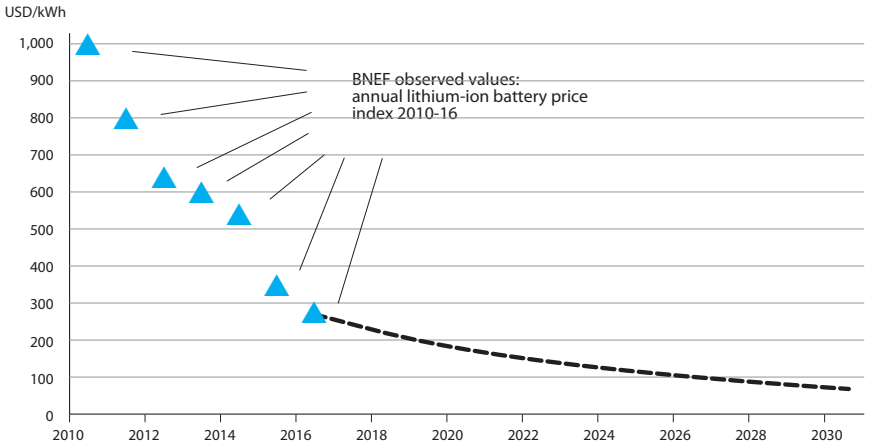
[1] *CO_2 emissions = fuel consumption x emission factor*
[2] *kg CO_2/megajoule (source:* Decarbonising Maritime Transport. Pathways to zero-carbon shipping by 2035*)*
Source: Draft Delegated Act on Monitoring Methods

Tab. 4. Main measures related to alternative fuels and energy[1]

	CO_2 emission reduction potential
Advanced biofuels	25-100%
Liquefied natural gas	0-20%
Hydrogen	0-100%
Ammonia	0-100%
Fuel cells	2-20%
Electricity	0-100%
Wind	1-32%
Solar	0-12%
Nuclear	0-100%

[1] *Emission reduction potentials are assessed individually. Ranges roughly indicate possible fuel savings depending on varying conditions such as vessel size, segment, operational profile, route, etc., hence limiting the possibilities for comparison. Numbers cannot be cumulated without considering potential interactions between the measures. Considering upstream emissions of synthetic fuels and electricity, an almost 100% emission reduction can occur only if produced by renewable energy sources*

Fig. 3. Annual lithium-ion battery price developments 2010-2030



Source: Bloomberg New Energy Finance (2016)

chemical, LPG), dry bulkers, car carriers, as well as an icebreaker and a patrol vessel. LNG is great for eliminating pollutants like NO_x, SO_x, and PM, but its GHG reducing merits are being questioned. On paper, burning LNG can result in emitting 5-30% less CO_2 as compared with the energy equivalent amount of heavy fuel oil (HFO). In practice, it depends on the engine's efficiency, i.e., whether methane, which is a far more GHG potent compound than CO_2, slips during the burning process. According to what the authors have to say in the *Decarbonising Maritime Transport*, if the slip is greater than 5.8 g/kWh, then any gains are offset (gas engines with a slip lower than 1.0 g/kWh are considered as efficient). To make things worse, methane also sneaks out during upstream operations – in fuel production, processing, transmission, and bunkering.

The idea to use hydrogen as fuel, and ship bunker specifically, has been gaining traction lately. Its environmental performance depends on how it's used. If it comes as a fuel cell or in pellets, it has zero CO_2 emissions (again, provided that renewables are used in the production process). It can also be used jointly with traditional fuels, lowering fuel consumption. For instance, according to the German start-up FUELSAVE, its FS MARINE+ hydrogen synthgas generator, which injects a gas and liquid water/methanol mixture into an engine's combustion chamber, delivers fuel savings of more than 11%. *Decarbonising Maritime Transport*, in turn, says that a 50/50 combination of hydrogen and HFO can result in CO_2 emissions going down by 43% per t-km. There are companies out there innovating to bring hydrogen to the market in a handy form – in containers, naturally – such as the Oxford-based Silicon Fuel which experiments with solid state hydrogen (read more in BTJ 6/17's *Power of the future? Hydrogen as ship fuel – zero emissions, no carbon footprint, competitive price*). The reason behind this idea is to free oneself at the root from the seemingly inherent difficulties the use of hydrogen creates – unsustainable amounts of energy required to produce fuel cells which despite the effort have then low energy density, hence challenging storage requirements (big tanks that take up space and need to maintain the temperature of -252.9°C). In addition, in order to make hydrogen truly ecofriendly, its production, relying on electricity, needs to be coupled with renewables as the energy source. If this requirement is met with the use of hydropower, then, according to the authors of *Decarbonising Maritime Transport*, the entire life cycle of hydrogen is 10 times' lower than of HFO's. On the other hand, there are currently no regulations on the use of hydrogen as ship fuel nor is there bunkering infrastructure.

Some of these shortcomings of hydrogen can be overcome if ammonia is used as a hydrogen carrier in fuel cells (ammonia alone has been used as fuel, although only in buses, delivering some CO_2, SO_x, and NO_x reduction benefits). Ammonia allows for more hydrogen storage per cubic metre and without the need for ultra-low cryogenic storage (only -33.4°C). The compound can also be combined with HFO, lowering life-cycle CO_2 emissions by 27%/t-km or by 34.5%/t-km if it is produced using wind power. Another advantage of ammonia is that its production, transportation, and port handling are already commercialised, though exclusively for the needs of the fertiliser industry.

The available fuel cell production technologies aren't perfect, and the final product they're able to deliver is both expensive and can only cover a portion of a ship's overall energy demand. For instance, the Proton Exchange Membrane Fuel Cell technology is sensitive to hydrogen impurities, while the Solid Oxide Fuel Cell requires a high operating temperature (800-1,000°C). That said, steamers sailing on Hamburg's Alster Lake are using the latter in a hybrid combination along with batteries and heat recovery, while Royal Caribbean will test fuel cells on-board its newbuild to be constructed at the Meyer Turku shipyard (the Canadian Burnaby-based Ballard Power Systems has already delivered the fuel cell power supply, while the Swiss-Swedish ABB will integrate the fuel cell module into the electrical system; the fuel cell's 100 kW will initially take up the cruiser's hotel load during port calls). Also, a new part on fuel cell power installations has been proposed to be added to the International Code of Safety for Ship Using Gases or Other Low-flashpoint Fuels.

Purely electric or hybrid propulsion is another avenue that has been pursued for several years now. According to *Decarbonising Maritime Transport*, if powered by renewables, an e-ferry can be almost carbon-free. A small ferry plying in the Norwegian fjords emits 95% less CO_2 than it would if bunkered with a fossil fuel; additionally, the ship's OPEX is 80% lower because of the electricity costs in Norway and the fact that the machinery of an electric ferry has significantly less parts (electric motors can also be cheaper than conventional engines). Battery capacity, not so much as the pack's cost (Fig. 3), is most probably the biggest issue with transitioning towards e-ships. Until recently, ships serving domestic routes were the only ones to go fully electric. Seagoing ships, on the other hand, use electricity either as an auxiliary source of power, meaning that they can reduce the power output of their diesel engines, or e-sail over a limited distance only before their combustion engines take over again. *Decarbonising Maritime Transport* estimates that the hybrid technology can deliver 10-40% savings on fuel and has a very fast payback time of just one year. That's exactly the idea behind Scandlines' ro-paxes *Berlin* and *Copenhagen* as well as the

Tab. 5. Potential decarbonisation pathways, their components, and resulting decrease in shipping's carbon footprint by 2035

	Operational measures	Technical measures	Carbon factor reduction due to alternative fuels	Electric ship penetration	Shipping CO_2 emissions in 2035 (vs. 2015)
Maximum intervention	Maximum	Maximum	80%	10%	44mt (-95%)
Zero-carbon technology	Moderate	Maximum	80%	10%	56mt (-93%)
Ultra-slow operation	Maximum	Maximum	50%	–	156mt (-82%)
Low-carbon technology	Moderate	Maximum	75%	–	123mt (-86%)

currently under construction *Color Hybrid* of Color Line. Two other ferries that used to sail in Scandlines' livery, *Tycho Brahe* and *Aurora* (now part of ForSea's fleet, know previously as HH Ferries), were not so long ago converted from hybrid to all-electric operations. Another breakthrough was made in 2017, when Guangzhou Shipyard International delivered a 70.5 m-long e-freighter that can cover 80 km after two hours of charging.

Using wind and/or solar power is another way to hybridise a ship. While the former technology comes in different sizes and shapes – soft/rigid/wing/hull sails, wind turbines, towing kites, and rotors – only the last two have reached market maturity (back in 2011, Stena Line's *Stena Jutlandica* was the first in the world to install wind turbines on-board a ferry; two 4 kW vertical wind turbines were put on the bow deck, but the concept did not catch on). Towing kites have been attached to two multipurpose ships and to a bulker, whereas rotors, which take advantage of the so-called Magnus effect, have been mounted on a ro-ro ship, a tanker, and a cruise ferry. According to Viking Line, Norsepower's rotor makes it possible to save up to 300t of bunker/year, thus decrease *Viking Grace*'s carbon footprint by 900t. "Given the different operating speeds, hull, machinery, weather conditions, seasons and routes taken, there is a significant amount of heterogeneity in the fuel savings and thus some degree of uncertainty to the amount of CO_2 reductions achieved by wind propulsion technologies. The abatement potential of wind technologies on ships is estimated to be around 10-60% […] and 1-50% of reduction in CO_2 according to a meta-study of existing estimates," *Decarbonising Maritime Transport* reads. The level of eco-benefits solar energy for auxiliary power on-board a ship can deliver also varies greatly. Depending on meteorological conditions, fuel consumption can be cut by 0.1-3%, resulting in lower CO_2 emissions of 0.2-12%. At the moment, there's only one example of a full-scale project that incorporates solar energy into a ship's power system. The in service since 2012 *Nichioh Maru* car carrier (commissioned by Nissan, built by Shin Kurushima Dockyard, and operated by Nitto Kaiun) has 281 solar panels installed on its upper deck, which, on an annual average, save the operator some 1.4kt of diesel and the environment around 4.2kt of CO_2. Because the technology is expensive (the panels are coupled with batteries), implementation is complicated, and the whole system takes up cargo carrying space, today *Nichioh Maru* can serve only as a case study, confirming that the technology indeed works but isn't the most viable in the market. Summing up the wind and solar thread, ITF authors cite Lloyd's Register, according to which technologies that promise a 10% reduction in fuel consumption become commercially sound if bunker prices are higher than $1.0k/t.

Methanol is another solution that has been up-to-date tested on-board a single vessel only, namely Stena Line's ro-pax *Stena Germanica* (there are cars running on methanol in China, but the fuel is produced with the use of coal, hence the solution, although cheap and readily available, has ultimately a negative GHG effect). Compared to HFO, methanol has lower emissions of CO_2, SO_X, NO_X, and PM by 25%, 99%, 60%, and 95%, respectively. It's currently produced from natural gas but can also be sourced from CO_2 capture, industrial and municipal waste, and from biomass – in other words, alike in the case of ammonia, there's experience in handling it. Methanol can be used as bunker following minor modifications made to the ship engines and bunkering infrastructure; a small portion (5%) of conventional fuel is still needed for ignition. Some €22m were needed to methanol-retrofit *Stena Germanica*, but the company says that the cost per vessel can be cut down to one-third of the sum if one decides to convert several ships at once (Stena Line has produced a tool kit for ship conversion in order to support replication). Methanol that the shipping line is currently receiving is produced with the use of gas, hence the whole solution delivers limited CO_2 reduction benefits only. As such, Stena Line plans to develop in the near future production based on biomass.

And finally, nuclear propulsion – rather a curiosity than something that will hit the big blue in the foreseeable future. It was in the 1960s and 1970s when nuclear power was making great promises – of both making a great leap forward and crippling the whole planet in a manner of minutes. It resulted in four nuclear-powered merchant ships: the US *Savannah*, the German *Otto Hahn*, the Japanese *Mutsu*, and the Soviet *Sevmorput*, of which only the last one made it to our days and actually acted as a real freighter, not as a showcase. Compelling as it might sound at first – no CO_2, SO_X, NO_X, PM emissions whatsoever and no need to "re-bunker" for years – using a chain reaction to propel a ship raises a number of operational as well as safety and security issues. Among many, there's the question of what to do with the spent, toxic fuel; where and how to decommission the ship's plant; overhauling international regulations to include nuclear as ship fuel (not to mention to issues of insurance or damage compensation); ensuring that these vessels aren't hijacked; investing in ship design and training the crew; convincing ports and terminals to handle such ships; and so on and so forth. While single parties blaze the trail in the use of niche bunker alternatives, virtually no company or state experiments with making nuclear propulsion a viable option for the shipping industry. After the Chernobyl and Fukushima disasters, nobody wants to take those odds.

Breaking a path

Having investigated all the above mentioned measures and their GHG mitigation potentials, authors of *Decarbonising Maritime Transport* mixed up the different levels of their uptake into four scenarios, the so-called decarbonisation pathways

(Tab. 5). As technical measures are the easiest ones to implement, each scenario assumes that all future ship designs will exploit what technology has to offer in terms of hydrodynamic, engine, and block coefficient improvements, along with using wind for assistance. Operational measures focus chiefly on slow steaming, with a small CO_2 reduction thanks to better berth planning and ships getting bigger; a moderate reduction in ship speed stands for 6% and 9% for container ships, and bulkers and tankers, respectively, whereas a maximum for 26%, 30%, and 65% for box carriers, tankers, and bulkers, accordingly. All scenarios foresee that conventional ship fuels will be replaced by alternative sources of energy, to a greater of lesser extent. The 80% scenario is a mix comprising 70% hydrogen and ammonia, 22% biofuels, 5% LNG/LBG, and only 3% oil-based bunkers. Next issue, namely whether electric ships will gain at least partial popularity. The two pathways that take this into account nevertheless assume that only 10% of vessels will sail on electricity by 2035, mainly serving short-distance routes. Here, the uptake will start from 1% in 2025, the date when OPS is to become available in all EU TEN-T Core Ports (currently only a handful out of 104 offer cold ironing).

Getting and staying motivated

Numbers, calculations, game changing technologies, alternative sources of energy, scenarios, falls in GHG emissions, etc., all of this is fine as a brain pep pill, a thing that works on paper without a glitch. What about turning ITF's pathways into reality? After all, even the least optimistic scenario promises to curb shipping's carbon footprint by 82%.

Market forces are somewhat contradictory. Some shipowners and operators are making a business case out of green shipping by lowering their bunker consumption or hoping to reap the first mover benefits of automating or electrifying their fleets. Others, at the same time, couldn't care less. Estimates to what degree external forces can push the maritime industry to make its operations more eco-friendly are a bit fuzzy. It's true that cargo owners and shippers are increasingly asking for green options, as they set their own GHG reduction targets, but as Rolf Niese points out in his article *Worlds apart?* on pgs. 24-27, collaboration between shippers and ocean carriers is far from perfect, and striking a win-win partnership between the two that would go on for years appears to be a challenge with a lot of moving parts that need to fit properly. Nonetheless,

Fig. 4. The maximum intervention pathway

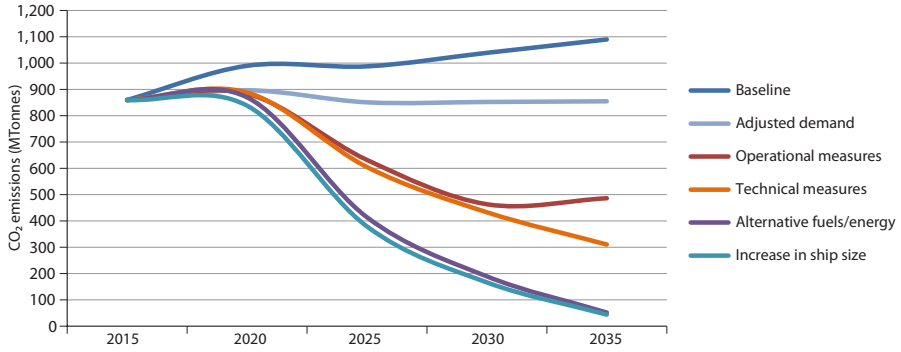


Fig. 5. The zero-carbon technology pathway

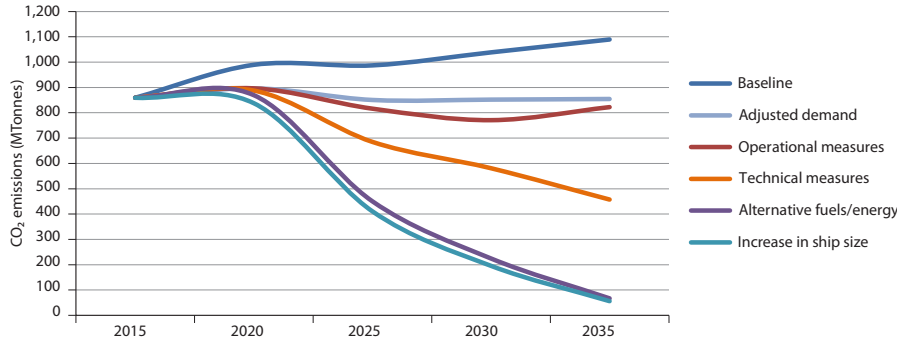


Fig. 6. The ultra-slow operation pathway

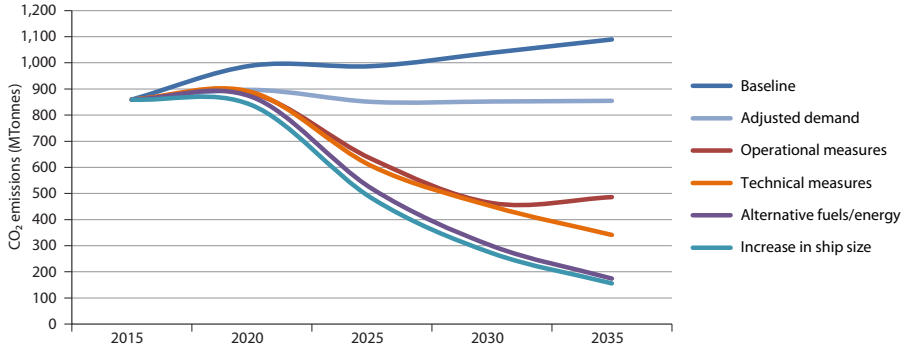
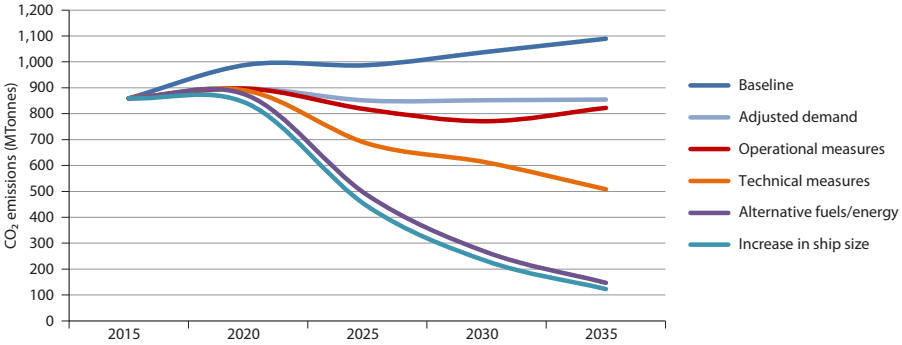


Fig. 7. The low-carbon technology pathway



shippers' demands are strengthened by the fact that insurers and investors are becoming more risk averse to carbon stranded assets, i.e. resources the extraction of which is no longer profitable (read more in BTJ 3/16's *Can we afford it? Road to a low-carbon future). Decarbonising Maritime Transport* also mentions a number of benchmarking initiatives, e.g. the Gothenburg-born Clean Shipping Index, that give shippers the data on the eco-performance of a given ship so they can make an informed choice.

Having mentioned the Swedish city, a number of port authorities around the world are taking action to confront the industry's negative impact on climate change. They have a clear interest in doing so, as extreme weather events and rising sea levels are directly harming their business (read more in BTJ 6/17's *Adapt or else. How ports can mitigate climate change risks*). Ports are in this regard approaching shipping with either a carrot or a stick. Gothenburg, for instance, has been supporting better ship energy efficiency since 2015. In mid-2018, the port authority decided to carry on with granting a discount for vessels that report good environmental performance. As such, a 10% discount on port tariffs will be granted to ships that achieve a certain level of environmental-friendliness in accordance with the benchmarks Environmental Shipping Index and Clean Shipping Index. The 20% discount, in turn, will be given to vessels running on LNG. The World Ports Climate Initiative as well as the World Ports Sustainability Program have been kicked off to facilitate best practices ports can engage in to add their fair share of effort in tackling the issues that are troubling the global community. Others aren't so polite. Vancouver wants to scrap its coal terminals and consequently coal carrier traffic. Venice is torn apart between the cruise business that contributes to the local economy through tourism but which also envelops the city with pollution.

This shouldn't mean that now one has the right to give shipping a hard time. A ship built today will sail the high seas for at least two decades, so fleet renewal will require time. Moreover, put yourself in a shipowner's position – will you rush into hydrogen, ammonia, or any other alternative bunker for which there's at present no supply chain, at least one that's specifically designed to suit the industry's need? "The lack of reliable information on performance in actual operating conditions then leads to a typical chicken-and-egg problem in which no firm is ready to adopt a technology – or no financier ready to finance a zero-carbon ship – because there is a lack of clear proof of its efficiency and commercial viability," ITF authors underline in their analysis.

That segues us to the question of whether there is any possibility of pressuring or encouraging shipowners to invest in green tonnage. *Decarbonising Maritime Transport* speaks of carbon pricing and specifically two possible schemes of implementing it. Since HFO isn't taxed, the shipping industry isn't held accountable for the negative externalities it creates, hence the idea to put a levy on ship bunker – the dirtier the fuel, the higher the tax. According to Lloyd's Register and University Maritime Advisory Services, a shift to biofuel- or hydrogen-ammonia-based zero-carbon shipping would become attractive if carbon prices were in the order of $250/t and $500/t, respectively. Money generated through taxation could fuel a research and development programme aimed at facilitating the green transition. Alternatively, shipping could be covered by an emissions trading scheme (ETS). Here each and every company would be granted a budget, exceeding which would require buying additional emission rights from better performing shipping lines. Yet, "Discussions within the IMO on market-based mechanisms […] during the late 1990s resulted in political stalemate, due to fundamental differences over desired design, perceived economic impacts and potential use of revenues of the mechanism. In those discussions, both carbon taxes, emission trading schemes and hybrid forms were proposed, to no avail." A lot has changed since then, so maybe re-opening serious talks about carbon pricing at the IMO level would encounter more favourable winds now than it did in the past. That said, the EU has postponed the potential inclusion of shipping into its ETS, leaving the IMO to sort things out, at least till 2023 for which another revision of the EU ETS is planned. Not waiting for others, China experimented in 2013-2015 with the Shanghai ETS, one of seven pilots carried out ahead of creating a countrywide system, that also included emissions caused (directly and indirectly) by ports and shipping. According to the Chinese authorities, the system achieved full compliance each and every year.

These actions can also be supported by other incentives, such as "straightforward" subsidies (that, however, do not breach state aid rules), tax breaks, exempting e-ships and OPS from electricity taxes, or adding decarbonisation as one of the conditions in public procurement of shipping services or if a company applies for money from a country's development bank or a sovereign wealth fund, etc. There are examples that such tools really work. For instance, decreasing GHG emissions was one of the criteria for awarding the contract to serve ferry traffic between the Swedish mainland and the island of Gotland. Destination Gotland won the bid by promising that it will invest in LNG-run newbuilds, recently handed over to the owner by a Chinese shipyard. Norway's Government Pension Fund Global has announced that it will continue to finance the shipping sector, but under the condition that decarbonisation measures have to be implemented. "Full decarbonisation can only be realised by transitioning towards zero-carbon ships; this transition can take some time but policy measures could help to advance this. Despite the global character of the shipping industry and the need for global regulation, there is also room for national initiatives to stimulate zero-carbon shipping," *Decarbonising Maritime Transport* wraps up the discussion.

The gap

Analysts from the ITF also write, "[…] getting close to zero carbon emissions by 2035 is possible […] even if it would require radical changes quickly. There is still a huge gap between what is technically possible and business as usual, and public policies […] can play a role in bridging that gap. Although there is evidence of potentialities, there are also uncertainties regarding the upscaling of alternative fuels, the production capabilities needed for this, shipyard capacity and retrofit docks and trade impacts for countries."

Maybe now it's up to the shipping industry to think all of this over and draw conclusions from the *Decarbonising Maritime Transport. Pathways to zero-carbon shipping by 2035* analysis, asking themselves whether it's worthwhile going off the beaten track – for the sake of their businesses or the environment or both. ■

Photos: GoodShipping Program

One atmosphere

by Anniek Sluis, *Growth Accelerator, GoodShipping Program*

Many are rightly preoccupied with the upheaval the lowering of the global fuel sulphur content cap, from 3.5% to 0.5%, will bring on 1 January 2020. This sweeping regulation is set to cause a spike in crude and fuel prices, even provoking US President Trump's intervention to slow its implementation, further confusing shipowners that are seeking to identify the best option to meet compliance in an already capital-starved market. As such, shipping is facing unprecedented challenges in terms of its fuel supply chain. A perfect storm is forming on the horizon and those inclined towards innovation are planning to take advantage of it.

The sulphur cap put aside, a far greater challenge awaits the industry, as it seeks to meet requirements to reduce carbon emissions from the 2008's level of over 1.0bt by 40% by 2030 and 50% by 2050. While the former is a target, the latter is a firm legislative requirement.

Increasingly on the minds of industry leaders looking beyond 2020, therefore, is the question how shipping will go about reducing its carbon footprint. It has become a commercial issue in its own right as well as a matter of social responsibility. In some ways shipping has come late to express in a clear and industry-wide manner how it will tackle its negative impact on the climate. Shipping represents almost 3% of all man-made CO_2 emissions – the same as Germany – and yet, until recently, the sector fell outside of any decarbonisation efforts mandated by the Paris Agreement. Indeed, apart from obligations at the European level resulting from the Monitoring, Reporting and Verification (MRV) legislation – which obliges all ships above GT 5,000 to report their yearly data on CO_2 emissions, and operational or design non-binding indexes like Energy Efficiency Operational Indicator and Energy Efficiency Design Index – shipping has been broadly exempt from any efforts to decarbonise.

Things changed this April, when the International Maritime Organization (IMO) reached an agreement on an "initial strategy" for the reduction of shipping's CO_2 emissions outlined at the very beginning of this section. Moreover, the agreement called for emissions reductions to begin as soon as possible – a clear call for action across the industry board. Whilst this agreement does not give a timetable for rolling out restrictions on carbon output – due to be incorporated in a further revision in 2023 – it does, however, provide a platform for the industry's future action on decarbonisation.

A new era

Clearly, these legislative changes are beginning to create the commercial setting for decarbonising the industry. As for today, however, there isn't a raft of easily-accessible measures that are at shipping's disposal to reduce its carbon footprint. In the short-term, energy efficiency technologies – such as wind power used for auxiliary propulsion or air bubbles that reduce friction under a ship's hull, matched with slow steaming for additional lowering of bunker consumption – will provide "quick wins" of, perhaps, 20% or 30% less pollution. However, for an industry that will not have the same access to renewables as the land-based transport and power generation sectors will, only genuine innovation around new low carbon fuels will enable shipping to meet the targets set by the IMO.

According to the latest market intelligence suggesting that liquefied natural gas (LNG) does not, on a source-to-combustion analysis, reduce CO_2, it is marine biofuels that are now recognised as the only impactful solution that is market-ready. In 2017, research found that biofuels, of any of shipping's potential alternative bunker solutions, remain the fuel with the most emissions abatement potential. Sustainable marine biofuels have the potential to reduce CO_2 by up to 90%, at the same time considerably reducing local pollutants, including

sulphur, nitrogen oxide, and particulate matter. Indeed, the classification society DNV GL, in the past a vocal advocate of using LNG as ships' fuel, has thrown its weight behind biofuels, saying that, "if we are to significantly reduce emissions from shipping as an industry without using nuclear fuel, the only real option we have today is sustainable biofuels."

Despite this, fuels on their own will not be a convincing solution. For a market that requires accelerated adaptation, a change in mindset is needed, too. Innovative fuel solutions require similar out-of-the-box models that fully take advantage of them. In an era when new solutions hit the market, market leaders across this supply chain – be them shipping lines, cargo owners, shippers, charterers, but also us, the customers – are more and more aware that decarbonisation can be approached more proactively.

All vessels emit into one atmosphere

Take shippers and cargo owners, for instance. In many ways, the shipping industry can be seen as something akin to a national power network, i.e., at some point almost all businesses make use of it. However, unlike the sustainable choices that conscientious consumers and businesses can make about how they receive power, e.g., by choosing a green or renewable supplier, they have historically had no agency over the type of energy used to transport their freight around the world.

This poses a great challenge for decarbonisation. For sustainably-minded cargo owners the only way they could reduce their seaborne transportation-related climate impact was to select an energy-efficient carrier, which was and still is a very limited option. Otherwise, they could offset their carbon footprint somewhere else in their supply chains – outside of the shipping industry.

In 2017, the GoodShipping Program was formed to meet these challenges. The initiative provides ocean cargo owners and shippers with a quick, traceable, transparent, and convenient way to reduce their carbon footprint. This is done through improving the shipping industry itself by, e.g., purchasing and driving the uptake of marine biofuels that directly change the marine fuel mix, not thanks to some alternative mitigation scheme.

By understanding the collective concept that all vessels exhaust into one atmosphere, the GoodShipping Program works on the principle that it does not matter for the purposes of carbon reduction which container vessel takes on biofuel instead of fossil fuels. By partnering with leading marine biofuels company GoodFuels Marine, the Program allows shippers and cargo owners to offset their emissions regardless of transport volume, location, trade routes, or existing contracts with carriers and freight forwarders.

This is just the start

In September 2018, five shippers became the first to save CO_2 emissions through the scheme, when GoodFuels Marine delivered sustainable marine biofuels to one of Samskip's container vessels in Rotterdam.

This milestone demonstrated that shippers do not have to be beholden to fossil-based fuel norms. As biofuels are 'drop-in' and compatible with fossil-based 'fuel equivalents', it does not matter how much fuel is added to the tank, as there is no detrimental effect to the engine. This first refuelling collectively reduced the carbon footprint of the participating shippers – Tony's Chocolonely, Dopper, Blygold, Magic Marine, and Mystic – by over 40t, equivalent to removing 24 cars off UK's roads for an entire year.

And this is just the start. By remaining flexible in its approach, this model provides far greater scope for immediate impact on a significant scale, whilst having the same net effect in realising shipping's decarbonisation. What the success of GoodShipping Program proves, is that innovative models, when combined with cutting-edge fuels, demonstrate the potential to change the shipping industry for the better today – and not at some indeterminate point in the blurry future.

As decarbonisation becomes an even greater commercial priority for the industry, more leaders from across the shipping supply chain will have to face a simple concept: in a closed system any CO_2 improvements are better than none, and the green-means are upon us with the advent of sustainable marine biofuels. ■

GoodShipping Program

The Amsterdam-based GoodShipping Program is the world's first global marine initiative that aims to change the fuel used in the marine market space. It wants to help stimulate and demonstrate the use of biofuels for as long as it is the best option to make the shipping industry more sustainable. The Program's 'Board of Recommendation' comprises selected experts in the field of sustainability, shipping, and/or biofuels, who we believe to have the power and ability to influence the container shipping industry. For more details please click www.goodshipping.org

Photo: Pixabay

A guarantee against inefficiency

by Stefan Schneider

FUELSAVE, a German energy efficiency start-up, has launched a technology the company believes is so groundbreaking that it is offering a contractual guarantee of a 10% reduction in a ship's bunker consumption. The company also says that the FS MARINE+ solution leads to a significant decrease in nitrogen oxide (NO_x) emissions as well as in filter smoke number (FSN) and engine's air intake manifold temperature. In other words, the engine is more efficient, cleaner, and runs smoother.

In a nutshell, FS MARINE+ is a patented, DNVL GL-approved engine efficiency enhancement system. It uses an on-board hydrogen synthgas generator to inject a gas and liquid water/methanol mixture into an engine's combustion chamber to improve efficiency.

The technology is up-to-date ready to be used with 4-stroke engines, running on heavy fuel oil (HFO) or marine gas/diesel oil (MGO/MDO). Further modifications will be made in the near future to adjust FS MARINE+ for 2-stroke engines as well as those running on liquefied natural gas (LNG; while the bunker gains for gas-run engines will be around half of those to be experienced with traditional diesels, hydrogen has been shown to have the potential to reduce the so-called methane slip, which, depending on the time frame, is a greenhouse gas 25-to-72 times' more potent than carbon dioxide).

So far, even though the test engine operated one cylinder only, the FS MARINE+ system was shown to reduce fuel consumption by more than 11%, NO_x by up to 36%, and FSN by 40%. The solution was also shown to reduce the engine's air intake manifold temperature by 50°C – without detriment to engine operation and performance whatsoever.

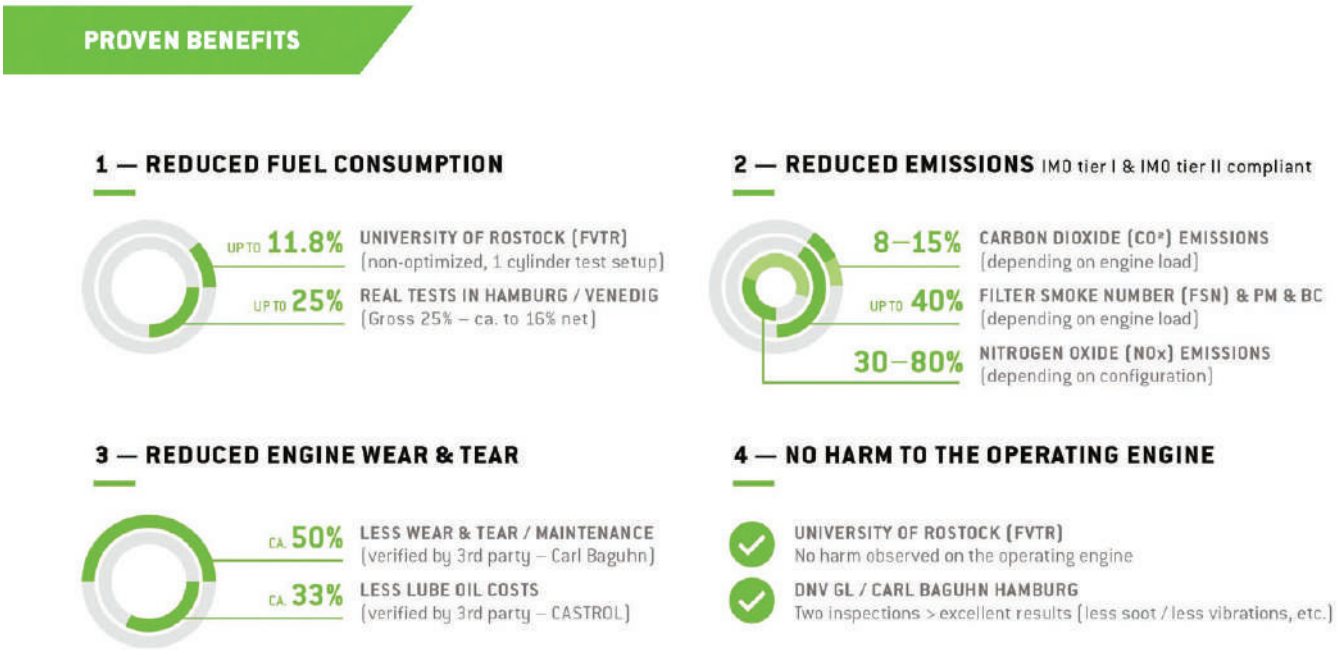
Good, better

Efficiency gains were confirmed during land-based tests carried out by FTVR, the same independent test laboratory at the University of Rostock used by engine builders to assess their products' emission behaviour. Next, similar results were achieved during pilot trials on a 4-stroke engine mounted on-board *Annette*, a 160 m-long heavy-lift crane vessel of SAL Heavy Lift. During the 30-month 4,000+ in operations hour-long trials, overseen and verified by the shipowner, independent third-parties, authorities, and engine service companies, the introduction of the FUELSAVE enhancement resulted in net fuel savings of more than 16%.

Carl Baguhn, a Hamburg-based engine service company, also reported less engine wear and tear; this was due to a cleaner combustion, cleaner cylinder heads, greater cylinder lubrication efficiency, and substantially fewer carbon deposits, all of which had a beneficial impact on engine maintenance. Last but not least, FS MARINE+ also extended the times between lubricating oil changes from 500 to over 1,500 hours. Carsten Körbelin, one of Carl Baguhn's technicians, said in this regard, "It is a matter of fact. We have been maintaining the owner's auxiliary engines for some years. They run on MDO, have always been well maintained and operated under normal conditions. But since we installed the FUELSAVE system, the engine has become much cleaner. There is no visible soot and engine running is much smoother, with reduced levels of noise and vibration. The improvement is astonishing. This is something very special." Janusz Rut, one of the engineers working aboard *Annette*, added to this, "From the vessel side the handling and attendance of the plant was easy and not bothersome. The service needful was limited to the minimum. The big screen gave an excellent view on all parameters. Summarising the hydrogen plant which was installed on *Annette* is worth consideration as a future solution for an air pollution reduction giving the profit for the owner at the same time. I am really pleased that I could take part in that project."

Universal, yet individual

FUELSAVE is not a one-size fits all solution but gets configured individually according to the specific requirements in order to achieve the best trade-off between efficiency enhancement and emissions reduction. However, any vessel can be retrofitted with the technology. It allows operators of older tonnage to achieve IMO Tier I and Tier II compliance and can be used with IMO Tier III engines for even greater



fuel efficiencies (this is because the emissions are controlled through the exhaust after-treatment system of a Tier III compliant vessel). No special training is required to run this completely autonomous system.

During the latest SMM trade fair that took place this fall in Hamburg, the company presented a containerised version of FS MARINE+. This setup features an all-in-one module that can be loaded on/off a ship, meaning that the system can be deployed without extensive preparations, thus cutting the installation costs down to the minimum handling required. This also gives the shipowner the flexibility to swap FS MARINE+ between different ships in virtually no time, e.g., when a vessel needs to go to a dry dock.

In addition, FS MARINE+ can be combined with other emission abatement technologies, such as scrubbers, which is crucial in the light of the 0.5% sulphur cap that will enter into force as of 2020. On the one hand, anyone not able to install a scrubber before this deadline will have to bunker more expensive low-sulphur fuel to comply with the more stringent rules. On the other hand, though, those who will make it before 1 January 2020 will face higher fuel costs, as a scrubber system requires extra energy to run. The mutual benefit of having a FS MARINE+ and a scrubber is, therefore, lower fuel consumption of a cheaper bunker (HFO). "When a scrubber is used in concert with FS MARINE+, higher fuel efficiencies can be achieved since the scrubber has less work to do, which equates directly to a greater reduction in fuel consumption. With a scrubber working with our process, we found shipowners can reduce the amortization rate for the scrubber which, currently does not provide a great return on investment," Marc Sima, Co-Founder and President, FUELSAVE, highlighted.

The industry standard

"Since 2008 shipping has been in a crisis and we decided to commercialize our cleantech and efficiency enhancement technology. While sending goods by sea is a backbone of global trade and economy, it is also a major source of polluting emissions. With FS MARINE+ we want to hit two birds with one stone – save shipping fuel costs and make it more eco-friendly," Sima stated.

FUELSAVE has been successfully implementing energy efficiency solutions for overland transports for the past four years. FUELSAVE has already been approached by shipyards and engine manufacturers interested in the technology and incorporating the FS MARINE+ solution in their engines, as a competitive edge over their competitors' products.

But it's not only about gaining the upper economic hand. We're only a blink of an eye away from the 0.5% sulphur cap. To meet the post-2020 requirements, FUELSAVE advocates the continued use of HFO/MDO/MGO in combination with a scrubber-FS MARINE+ mix.

All in all, FUELSAVE is confident that FS MARINE+ will deliver tangible economic and environmental benefits from day one, as well as have a ROI of three years only (within a five-year-long warranty, support, and maintenance period). "We aim to establish FS MARINE+ as the industry standard for fuel efficiency across the maritime industry," Sima summed up confidently. ■

FUELSAVE

founded in 2012, the German start-up, headquartered in Walldorf, is committed to enhancing fuel efficiency and reducing engine emissions in an innovative and environmentally-sustainable way for a variety of industries and applications thanks to its patented systems, all designed in accordance with the company's motto, "Save Energy, Save Money, Save the Planet." For more info please go to www.fuelsave-global.com

Photos: CRIST

CRIST shipyard confirms: “innovation distinguishes between a leader and a follower.”

by Przemysław Opłocki

Gdynia’s shipyard CRIST is a well-established and experienced company specializing in shipbuilding, offshore constructions, steel structures, and sea and civil engineering. We’re talking with Karolina Parkitna, Head of Administration Department, CRIST S.A., about the company’s ongoing projects, advanced international collaboration as well as the current challenges of the labour market.

Karolina Parkitna, Head of Administration Department, CRIST S.A.

■ **CRIST S.A. is a 29 year-long tradition, a company well-respected in Poland and abroad, which was so well illustrated by a recent award for one of the best Polish exporters to France. Since its inception, CRIST has been involved in over 300 projects including the latest *NB 70* (hybrid ro-pax ferry), *P 310 Elektra*, and *NB S.C. 75/1* and *75/2* (last two for transporting live fish).**

On the European as well as the global market we were known for producing large jack-ups (*Thor, Innovation*, *Vidar*) for the offshore sector. The market has changed recently; therefore we modified our production profile and concentrated on building other units. Using our offshore experience we were able to make a jack-up for the construction of an overpass around the Reunion Island (French: *Zourite*, or “Octopus” in Creole). We’ve also entered the hybrid-ferry market, an example of which is *Elektra*, built for Finferries. We are especially proud of that unit because it won one of the 2018 Marine Propulsion Awards (“Ship of the Year”) in a contest organized by the prestigious magazine *Marine Propulsion & Auxiliary Machinery*. What’s interesting about *Elektra* is that it uses only electric engines that are charged during passenger boarding and disembarking; the installed diesel engines are only resorted to in case of emergency. In addition, we are currently building another hybrid ferry for Iceland (*NB 70*), which will be turned over to the client around the spring of 2019. In the summer of 2019, on the other hand, we’ll finalize another live fish carrier-type unit – *NB S.C. 75/2* for the Norwegian shipowner Arctic Group.

■ **Fruitful cooperation with international partners, such as the Ulstein, Meyer Werft, or Chantiers de l’Atlantique shipyards, resulted in many multinational projects in which CRIST took part.**

We’re teaming up with the Norwegian shipyard Ulstein in the construction of hulls, i.a., in a vessel servicing wind farms (NB 313), a ship for the National Geographic (an expedition-type ship for researchers and tourists), or the world’s

largest hybrid ferry (NB 311). We're happy to be involved in building such large and innovative vessels. Another segment of our production includes partially equipped blocks and sections for cruise ships, which we're producing for a French shipyard Chantiers de l'Atlantique (formerly STX France). Recently, we've begun collaborating with another large-scale partner, shipyard Meyer Werft. We're also open to a broader variety of projects, such as the floating dock Marco Polo (NB 56) utilized to construct caissons as a foundation of the new embankment in Monaco, in addition to the previously mentioned ferries for Finns and Icelanders.

■ **How, in the recent years as well as presently, have you built relationships with the European players in the shipyard industry, and has that translated into an increase in orders compared to previous years?**

It's a very dynamic market. Just eight-ten years ago, the large passenger-ship building industry was very different. Due to the ageing of the current fleet, there's a dynamic exchange of the older vessels for the latest models taking place among the cruise ship companies like the Royal Caribbean. They need modern, ecologically compliant, comfortable ships. There are only a handful of shipyards across the world that are capable of producing such large vessels, among them, Chantiers de l'Atlantique in France and Meyer Werft in Germany. We're mindful of the fact that their order-portfolio reaches as far forward as 2025 or even 2028. This is an opportunity for the smaller shipyards to take part in these types of advanced projects.

■ **If we're talking about projects currently in progress, are there any others that are especially important to you?**

Norwegian orders are a big bulk of our projects. That's a niche market that revolves around oil extraction and fisheries. In the case of offshore market stagnation, many of the units that we have been building for the Norwegian clients are fishing ships and vessels to carry live fish. In this context, it's worth mentioning our already finished live fish carrier *NB S.C 75/1* and its twin *NB S.C. 75/2*, which we're working on right now and will be commissioned this summer, both for Norway. In the framework of the previously mentioned floating dock for Monaco, it's possible that more similar constructions will be produced in our shipyard. We can't be certain that these types of unique projects won't be something we'll be doing in the future. It's crucial for us to find a balance between what we can do production-wise and the number and size of orders.

■ **Regarding the labour issue, presently you have around 1,300 people involved in the realization of your current orders (not including contractors). At this time, what are your needs when it comes to the labour force?**

At present, we need around 300-400 more workers. We'd prefer to have as many employees as possible to be directly affiliated with our company. Direct working relationship translates into better relations within the company, greater interpersonal integration, and stronger worker identification with our shipyard. When subcontracting, we don't have a direct influence on workers who are involved in the production process. We would like to increase our own workforce, which requires a good understanding of the job market in Poland as well as abroad.

■ **What's the situation in the labour market?**

What we're dealing with right now is a worker's market. According to the labour departments that we're in communication with, the

number of registered unemployed is very low at this time. There aren't very many well-qualified job seekers. Of course, we try to attract employees in various ways. We're also looking for people with no experience to train them, knowing that the market is lacking in specialized workers. We put emphasis on the recruitment of qualified blue collar workers because engineering positions don't have a high turnover and we don't experience comparable deficits in that sector. Unfortunately, school reforms from a few years back have adversely affected the status of vocational schools, the consequences of which we still feel in the labour market. In order to counteract this trend, however, we maintain a strong cooperative relationship with technical and vocational schools as well as universities. This year we want to engage in projects that raise awareness among students and their parents. Until now, young people could visit our shipyard with their teachers. We want to continue this programme, adding at the same time other elements such as lectures in schools, active participation in open houses, and we're also considering the possibility of introducing new internship programmes for the best students.

■ **Given the problems in the Polish labour market, do you find it necessary to hire workers from abroad?**

Yes, very much so. The present labour market dictates a flexible and open approach. Our company, as well as those who collaborate with us, work with people from other countries.

■ **What are the pros and cons of working with subcontractors, especially in the light of your negative experience with one who employed North Korean nationals who weren't properly authorized to work in Poland?**

This situation was a difficult one for us. In recent years, CRIST collaborated with many entities both on the Polish and the international market. Armex, a company which was one of our local subcontractors, employed some North Korean workers. According to provided documents, the employees were legally in Poland and received an official work permit obtained from the Voivodeship office. After receiving information about possible irregularities relating to the employment of the North Korean nationals, in July 2016 we ceased our partnership with Armex, concerned about maintaining our high employment standards. We trusted the Polish employment control system and Armex, and even though the actual employer of the mentioned workers was Armex, the entire media odium and outrage fell on us. The control of legal status and employment rested on us instead of the government. Regardless, we approached the whole situation as a lesson that propelled us to improve our internal procedures in CRIST. Informed by this experience, we acted on an invitation from the Ministry of Investment and Economic Development to participate in a workgroup dealing with employer-employee relations. We're actively involved with a team working on developing a comprehensive guide for entrepreneurs. We're participating in the workgroup because we believe such a guide is an essential tool for businesses operating in the current market in situations where employing workers from other countries is necessary. It's important to learn how to identify risks associated with this type of relationship. Collaboration with subcontractors, especially those who employ foreign workers, might come with many hazards, such as whether the job is performed legally or if the employment and residence permits haven't been taken away from the worker. For this purpose, we carry out audits verifying the status and working conditions of employees on behalf of our subcontractors. We check, among others, workplace standards and employment legality. This, of course, isn't an easy task and requires a lot of work and certain procedural changes. We have created special anti-discrimination and employment legality procedures, thanks to which we can verify that workers employed by our subcontractors, via any type of contract, are legal residents with proper and valid residence permits.

■ **How does CRIST get involved in the community?**

We made a decision to get involved with various social projects and charitable organizations. Some examples include our collaboration with different schools, our involvement with the Dutkiewicz Hospice (Hospicjum im. Dutkiewicza) in Gdańsk, our support of Cancer Fighting Academy (Akademia Walki z Rakiem) and initiatives for young people such as Odyssey of the Young Minds (Odyseja Młodych Umysłów). We were also the sponsor of the Arka Cup – a small local football tournament organized by the Arka Gdynia Club. As part of the Tri-City community, we have decided to partake in these types of initiatives. They don't have to be events related to our industry; we get involved because our location is very important to us. After all, we're all a part of this Tri-City "courtyard" – so to speak. Returning to the shipbuilding industry, we would like to more actively carry on a dialogue with actors involved in our industry. When it comes to external communication, we try to maintain an on-going dialogue with entities in the global market as well as stay in contact with international media to keep them updated on our activities. We have also set up a YouTube channel which showcases our shipyard.

■ **From the perspective of CRIST, what are the biggest challenges for the shipbuilding industry in the context of ecology?**

Of course we are actively trying to implement all current environmental guidelines. Environmental policy, which we have implemented, is a requirement set by the International Organization for Standardization. The policy is at times difficult to integrate, but we collaborate with companies that help us resolve all the problems related to identification and reduction of environmental threats, and limit and report them, among others. We operate in full compliance with the law as well as the dynamically changing guidelines. We set realistic goals and try to implement them year by year. It's also important to remember that ecology is not just about procedures and waste management. In our case, it has a more direct aspect to it as well, i.a., caring for homeless cats that live in our shipyard. In this context, we're seeking to establish collaboration with the Kotangens foundation, which is an animal rights organization.

Interview with Grzegorz Dyrmo, Managing Board's Vice-President and Director, Infrastr ucture and Properties Management, the Port of Gdynia Authority

Photos: Port of Gdynia

A never-ending story

by Przemysław Myszka

The past year brought another cargo handling record for the Port of Gdynia, including a double-digit increase in container turnover, enhancing its position as one of the Baltic Sea region's prime universal seaports. That said, this success, paradoxically, brings about major concerns. Gdynia's firing on all cylinders already today and hungers after land to accommodate the future growth. We're talking with the Vice-President of the Gdynia Port Authority's Managing Board, Grzegorz Dyrmo, about both the freight and passenger results from 2018, what's the outlook for this year and beyond, setting up a new ferry terminal and the so-called Outer Port, as well as about hinterland connectivity and digitalisation.

■ **How has the past year turned out to be for the port – in terms of freight turnover, passenger traffic, and economic performance? What's the outlook for 2019?**

The past year brought another all-time high in cargo traffic, up by 10.7% on the result from 2017 to a total of 23.5mt, a figure we initially forecasted in our master plan to hit in 2020. Although the Port of Gdynia is now a one big construction site with numerous investments being rolled out through its quays, which may to some degree interfere with freight handling operations, we hope 2019 will end as positively as the past year did, if not better. The same holds true for passenger traffic, both ferry (over 680k) and cruise. Regarding the latter, with over 100k guests, we have experienced over 15% growth in 2018. The number of cruise calls remained more or less on the same level as previously, meaning that the lines started to send bigger cruisers to us. Again, we're hoping to do as well this year as we did in 2018. However, we can expect a pleasant cruise-surprise here and there, which will only add to the end result. For the time being, cruise ships will continue to be served at the French Quay. At the same time, though, we're looking into if the English Quay, currently housing the facilities of Dalmor (in the past a shipowner specialised in sea fishing, today a property developer), can be rearranged in such a way to accommodate cruise vessels, too.

As far as the ferry traffic is concerned, we've just signed the agreement covering the set up of a completely new ferry terminal, a project worth some €48m. The new facility, designed in accordance with Gdynia's unique modernism architecture and located just next to the port entrance, will make it possible to handle larger ships, up to 240 m-long, and a growing number of ferry passengers. In result, the widely-acclaimed Stena Line's Gdynia-Karlskrona route, a Motorways of the Sea project, will get new growth opportunities, but we're also hoping to attract at least one other ferry operator who'll connect our port with another destination, not necessarily a Swedish one. The new terminal will also be an intermodal-friendly facility in order to directly rail-ship the in- and

Grzegorz Dyrmo, Managing Board's Vice-President and Director, Infrastr ucture and Properties Management, the Port of Gdynia Authority

outgoing trucks and trailers. Lastly, the port's balance sheets. Despite the fact that our port is smaller than Gdańsk or Szczecin-Świnoujście and that we handle less cargo, the premises we take care of are short of being utilised to their full potential by a few percent only. From the perspective of a landlord – and our port was the first in Poland to fully privatise its port operations several years ago – everything which was possible to be leased out, has been. Moreover, the space in the high storage warehouses we're setting up on the lands we recently acquired have already been rented, though the facilities aren't finished yet. It only shows how the port industry seeks for additional space to work on, as more and more clients want to benefit from Port of Gdynia advantages. As such, it comes without surprise that a single euro invested in the Port of Gdynia returns four times' more than in the case of our competitors.

- **Gdynia is an in-city port, with not much room left on the landside to manoeuvre. As such, the port authority is gearing towards setting up the Outer Port.**

Indeed, we've found ourselves in a particularly challenging position. No matter how investment-savvy one might be, the investments are limited to an area that won't stretch like rubber. Already now, on average, some 70-75% of the terminals' capacity is utilised, which means that they're starting to run short out of breath.

As such, the 180 ha-big Outer Port is to be up and running by 2026. In its entirety, it'll be focused on container traffic, doubling the port's annual capacity to 4.0m TEUs. While already today ocean-going container vessels call to Gdynia, we want to approach the lines with tailor-made infrastructure thanks to which they'll establish direct and regular services which will make Gdynia part of the global deep-sea shipping network. The terminal's quay wall will offer four 16 m-deep berthing stations and vessels up to 480 m in length and 72 m in width, respectively, with capacities way beyond today's 20k+ TEUs, will have the possibility to call to the Outer Port. Truth be told, only the 15.4 m-deep Danish straits will put a limitation on the shipping lines coming with their largest vessels to Gdynia. That said, there're talks taking place in the port and shipping industry about adjusting the entrance channel to the Baltic as well. Remember, investments such as ours are crafted to stay in the game for decades following their commissioning, and we all know too well how container vessels have grown over the past several years.

In addition, we plan to make the space for a terminal handling liquefied natural gas (LNG). Not only is there a growing number of gas-run vessels, including large container carriers, but there're numerous Baltic-wide examples of industries turning to LNG. Gdynia's power plant, for instance, will have to shift onto a cleaner source of energy in the near future, and natural gas seems to be the most viable option.

It'll be a big move forward for our port and one that fits squarely into what's happening in other harbours. For instance, Rotterdam had to erect the Maasvlakte II, nearby Gdańsk, both the Port Authority and the Deepwater Container Terminal Gdańsk, or Klaip da also need to reach out towards the sea if they want to grow further. The tricky part is to design the whole thing so that the new part won't cannibalise to "old" one, so to speak. Our analysis shows two things in this regard. First, because of all the investments we're currently carrying out in the existing/inner part, it'll remain competitive post-2027. Second, by 2045 Polish Ports will have to handle approximately 10m TEUs/year – the amount the entire Baltic Sea region takes care of today – so there'll be plenty of boxes in need of attention for our ports as well as in the ocean and feeder/short sea traffic. More cargo coming to Poland in seaborne containers will translate into bigger income for the country's budget. In this context, the Outer Port will generate some PLN3.0b of additional revenues, equivalent to around 1.0% of the GDP.

In case of need, the inner parts of the port could find new affordances. In this regard, we're investigating the potential to meet the demand of the offshore wind industry. Our terminals already have the experience in handling of oversized cargoes, coming to and from the port on-board vessels and with the use of trains or trucks, so we can go full scale if the winds become favourable. As they say, flexibility is king in logistics.

We're working our fingers to the bone with the Outer Port. The design is ready, and the environmental impact assessment is halfway completed. Meanwhile, we've done our economic and cargo traffic forecast homework along with other paperwork, including that on the rail and road accessibility, that's legally required for executing such a mega project. We're also discussing the lease agreements with potential operators, who, on their side, will decide on what kind of

superstructure to invest in – whether it'll be a container terminal manned by people, or a semi- or fully-automatic setup. The last option doesn't mean that the Outer Port won't generate any new jobs; on the contrary, we foresee that 400-700 direct and some 7,000 indirect positions will be created.

Wrapping up, in about three-to-four years, the port's inner part will be completely modernised. After a few additional years, the Outer Port will join. What's more, there're plans to start shipping cargo along the Polish inland waterways, so maybe container barges will become a fixed feature of our cargo traffic as well. All in all, Gdynia will remain a universal port, not focused on one particular commodity but taking care of various goods, be they dry or liquid bulk, unitised freight, or break-bulk, serving the ferry and cruise traffic for good measure. Developing a port is a never-ending story.

■ **Some say a port is as good as its hinterland connections. While the Port Authority and terminal operators can put in place the best roads and railways, their decision-making power in this field ends at the entrance gate. What is then the current road-rail state of affairs in Gdynia and what will change in the future?**

Though it's true the Port Authority cannot build the access infrastructure outside its premises, it can engage in lobbying city-, Voivodeship-, and central government-wise. It all boils down to reaching the right people and in the right way with what's otherwise a straightforward message – a port needs quality hinterland access in order to properly operate. As such, we're striving to convince the government to include the so-called Red Road in the amendment to the country's maritime legislation as a necessary part of the port's hinterland access – and it's very likely it'll happen. In short, without this bypass, Gdynia will be jammed, seriously undercutting the capacities to move trucks to and from the port. First works on the Red Road should kick off next year, and we're keeping our fingers crossed for this project to be ready way ahead of the Outer Port.

Next, the set up of the so-called Logistics Valley, a co-op between eight municipalities, will add capacity to better manage the flow of trucks by, e.g., eliminating the need to park the lorries in Gdynia only. Digitalisation will add its two pennies-worth as well. Truckers will be notified where and when they can arrive at the port, thus sparing them the rush-to-queue fever.

On the rail side, the situation is noticeably better. Poland's railway infrastructure manager is already executing a number of projects or will do so soon, thanks to which more goods will be brought in or leave the port on-board trains. Out of these, the two most important are adding a third rail track to the line that goes through the Tri-City area of Gdynia, Sopot, and Gdańsk, and restoring for freight traffic the historical Coal Thoroughfare, which is Line 21, that altogether omits the two neighbouring cities. By 2027, we want at least 40% of the port's cargo traffic to be rail-borne, up from today's 25%. We're certain that we'll reach this target or may even overshoot it if only our own and the manager's projects are commissioned in due time.

■ **How is the port tapping into the digital revolution?**

Apart from the app we're developing together with the Poznań-based Institute of Logistics and Warehousing (ILiM) to streamline the flow of trucks, we've already put to the test other digital tools, including a notification solution for cargo trains, which now can arrive at the port on time. Next, there's an RTK GPS-based ship manoeuvring system to make the piloting operations more precise, efficient, and safer. We think it's fair to say that the safety of ship operations in the Port of Gdynia is second to none.

Technology also comes in handy in nurturing our ties with the local community as well as the environment. Cargo handling operations can be at times quite intrusive. For instance, citizens were complaining about coal dusting last year. We took these remarks to heart and reacted accordingly. The Maritime Bulk Terminal Gdynia invested in several solutions. Among many, there is a liquid cellulose mobile spraying system which keeps the coal dust from being lifted by the wind or a truck cleaning platform, so the specks aren't carried outside the terminal. The company will also put in place, in the near future, a covered conveyor belt, that'll be additionally equipped with a spraying system and use bigger crane clamshell buckets – all in order to minimise the dusting. Lastly, we monitor the air quality, and the algorithms we use can predict how it'll change due to weather forecasts and ship traffic. The monitoring results are freely available on the Internet.

Photos: Continental

What do tires have to do with ports? Continental knows the answer

Ever bigger, ever faster – ever smarter, ever safer

by Otto Walter

In a globalized world, ports remain the heart and centre of world trade and international logistic chains. However, in times of constant change, the future of ports is shaped by global changes and challenges. The technology company Continental has derived five major trends for the future of ports: speed, sustainability, smartness safety, and, above all, scale.

Julian Alexander, Head of Marketing & Sales Europe/ Middle Eas/Africa (Business Unit Industrial Tires)

"Size matters – also in the worldwide sea transport," Julian Alexander, Product Line Manager Material Handling at Continental Commercial Specialty Tires, makes it clear. In 2017 alone, the Port of Rotterdam, where TOC Europe 2019 takes place, saw a strong growth in container throughput of 12.3% (in tonnes) and 10.9% (in million TEUs) leading to a total cargo throughput rise of 1.3% from 461mt to 467mt. "This is why, operations in ports get more and more diverse and complex. Loads become even heavier and bigger and, in most cases, they have to be handled within the existing terminal infrastructure at the same time," Alexander underlines. A mammoth task that calls for two major subtasks: loading and carrying loads over longer distances and picking and stacking them to great heights. "But whatever move you make in a port – in the end they all have to fit together like a puzzle," he says.

Intelligent tires for smart & safe port operations

Continental offers a comprehensive range of tires for both pick and stack applications and load and carry applications. Since 2013, V.ply tires for pick and stack applications have been ensuring high stability and a good wear performance. "And with our port plus compound launched last year, we are taking this wear performance to the next level – and doing good for the environment, too. Cause less wear equals a cleaner and eco-friendlier port," Alexander points out.

New is that Continental will be launching an additional radial tire portfolio for load and carry applications in 2019. "Where vehicles carry heavy loads over longer distances at higher speed, tires have to withstand an enormous heat development – a radial construction is the perfect fit here," Alexander explains. As such, all Continental radial tires will come with pre-installed tire sensor that measure tire temperature and air pressure. The data can be visualized with handheld tool or display in the driver's cabin, or on the web portal ContiConnect if the need arises to monitor an entire fleet.

"With our intelligent tires, we integrate tires in the port infrastructure, contribute to smooth operations free of downtimes and – of course – increase the safety. Knowing the "health" of the tires can also help to avoid accidents – and keep dockworkers safe and healthy," Alexander concludes.

For more information, please visit: www.continental-corporation.com/en/press/fairs-events ■

Continental will exhibit their portfolio of tires and solutions under the theme 'Every move you make' at this year's TOC Europe at Ahoy Rotterdam, Hall 1, booth D72.

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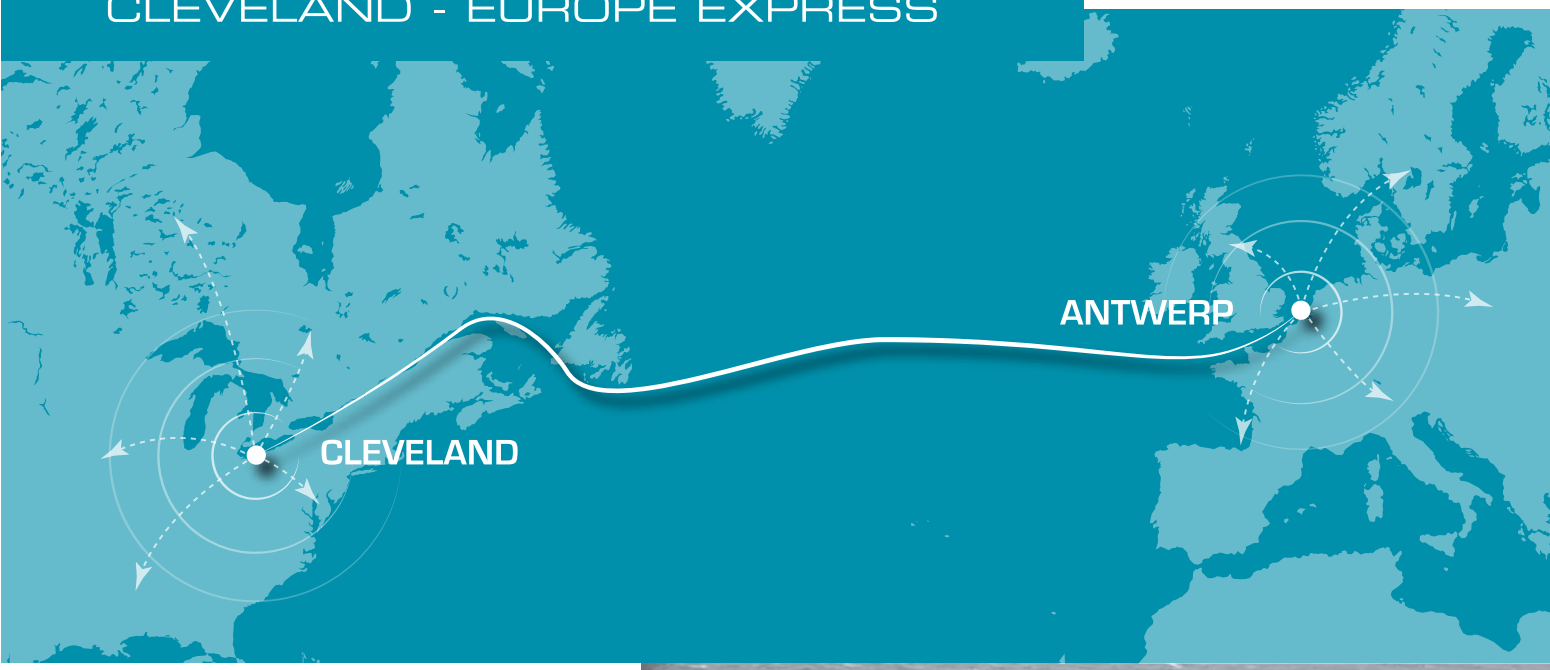

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21-23 May 2018
DE/Bremen

The event will be attended by approx. 400 exhibitors and sponsors, and will be a possibility to not only see the latest products and services, but also learn new skills in the educational workshops, micro-seminars, and exhibitor-led sessions.

ESPO Conference
23-24 May 2019
IT/Livorno

The theme of this 16th edition of the ESPO conference is "Europe's ports in a new world". The world is undergoing revolutionary changes. Climate change, digitalisation, geopolitical crises and looming trade wars, automation and increased citizens' engagement are among the main game changers. Imagine discussing the new world and its impact on ports in a beautiful 19th century theatre and, for the Conference Dinner, enjoying the Livornese cuisine with the other delegates in an old medieval Fortress in the middle of the port for the official Conference Dinner.

LNG Conference 2019
27-28 May 2019
SE/Gothenburg

The premier LNG event gathering the top movers and shakers of this rapidly developing industry. It is here where business meets opportunity – expert speakers, engaged audience and an environment enabling a hands-on experience. The event will put a special focus on the Baltic Sea Region, while at the same time keeping an eye on the main developments in Europe and the rest of the world.

Posidonia Sea Tourism Forum 2019
28-29 May 2019
GR/Athens

The Posidonia Sea Tourism Forum is a biennial international Conference and Exhibition that addresses the hottest issues of sea tourism in the East Med region. With the active involvement of CLIA Europe, MedCruise and cruise lines operating in the Mediterranean, the Posidonia Sea Tourism Forum has become the most important business platform for stakeholders in the East Med.

CruiseConnect Europe Summit
29-30 May 2019
ES/Barcelona

Building on years of experience in bringing together crewing professionals across the CrewConnect series, CruiseConnect Europe Summit, designed as a counterweight to the typical large expo-type events, will focus on the specific challenges facing the cruise industry and cover aspects such as building a talent pipeline, multi-cultural training, technology, delivery of customer service in a culture of safety on board, and plenty more.

ITS European Congress
3-6 June 2019
NE/Eindhoven

The ITS European Congress, organised by ERTICO – ITS Europe, is the largest event entirely dedicated to smart mobility and digitalisation of transport. The event will be built around three pillars: international programme sessions and presentations with top speakers from the industry; demonstrations of the current transport technologies developed and deployed throughout the world; and exhibition of cutting-edge companies.

transport logistic
4-7 June 2019
DE/München

This trade fair has established itself as a 100% transport & logistics showcase, presenting in one place the entire value chain as well as major international market players. Transport logistic combines innovative products, technologies, and systems with pooled expertise and a strong sales focus.

Nor-Shipping Conference
04-07 June 2019
NO/Oslo

Nor-Shipping is at the centre of the oceans. This is where the maritime and ocean industries meet every two years – a natural hub for key decision makers from across the world to connect, collaborate and do deals to unlock new business opportunity. This is your arena for ocean solutions.

European Environmental Ports Conference 2019
12-13 June 2019
BE/Antwerp

June 2019 will mark the arrival ACI's third European Environmental Ports Conference. The event will bring together senior representatives from the global port community and shipping companies, as well as environmental policy-makers, academic experts, consultants, and technology providers, to tackle the most pressing topics of the maritime industry.

We invite you to cooperate with us! If you wish to comment on any key port issue, share your feedback or have information for us, do not hesitate to contact us at: editorial@baltic-press.com, +48 58 627 2320/ 2321.

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